DOCUMENT RESUME

ED 244 756 RC 014 769

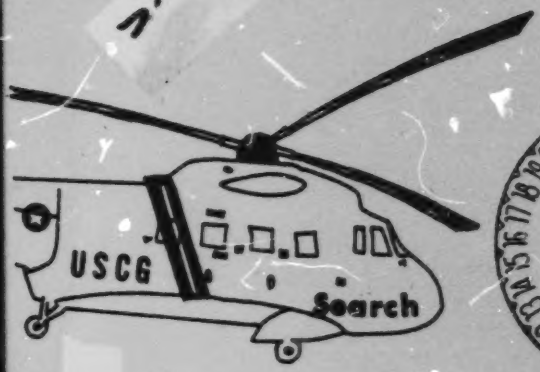
AUTHOR Dalle-Molle, John
TITLE Helicopter Operations and Personnel Safety (Helirescue Manual). Fourth Edition.
INSTITUTION Emergency Response Inst., Tacoma, WA.; Survival Education Association, Tacoma, WA.
PUB DATE Apr 80
NOTE 82p.
AVAILABLE FROM Survival Education Association, 9035 Givens Road, Tacoma, WA 98445 ($5.00).
PUB TYPE Guides - General (050)

EDRS PRICE MF01/PC04 Plus Postage.
DESCRIPTORS *Aircraft Pilots; *Emergency Squad Personnel; First Aid; *Leadership Responsibility; Outdoor Education; *Rescue; *Safety
IDENTIFIERS Emergencies; *Emergency Evacuations; Emergency Preparedness; *Helicopters; Search and Rescue Missions

ABSTRACT

The illustrated manual includes information on various aspects of helicopter rescue missions, including mission management roles for key personnel, safety rules around helicopters, requests for helicopter support, sample military air support forms, selection of landing zones, helicopter evacuations, rescuer delivery, passenger unloading, crash procedures, wind indicators, and helicopter signals. Appendices include descriptions and performance guides for 16 types of helicopters, helicopter capabilities and limitations, basic heliport rescue kit contents, equipment sources, selection of landing zones, uniform grid map system, air transportation agreement and manifest, guidelines for military aircraft rescue, fire fighting procedures, air control and security, and a guide to the use of aircraft in support of land search and rescue operations. (SB)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****



4
MAY 1984
RECEIVED
ERIC/CRESS

NATIONAL ASSOCIATION FOR SEARCH AND RESCUE

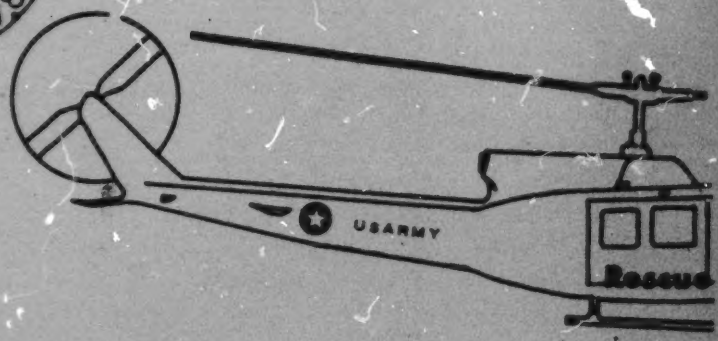
ERI

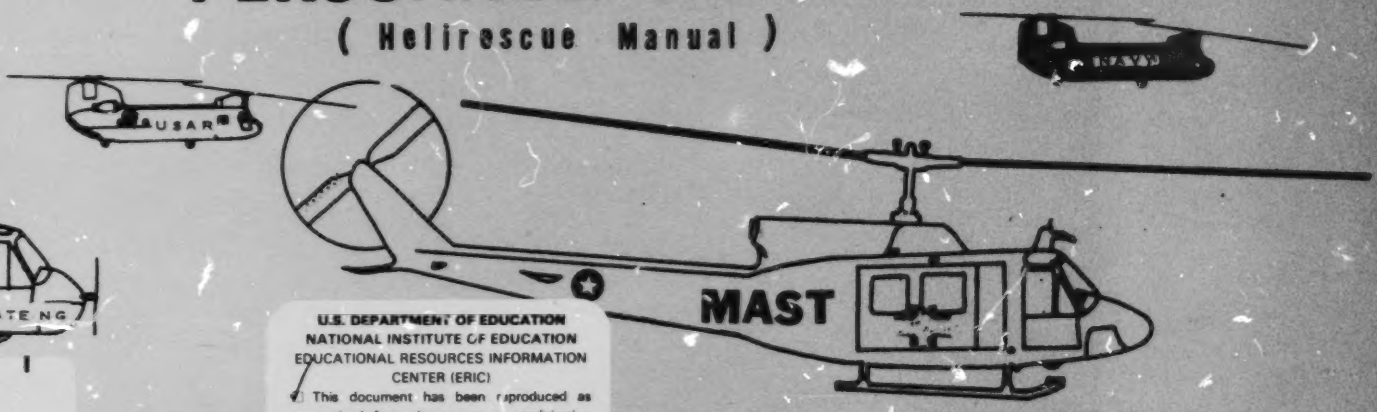
Emergency Response Institute

ED244756

HELICOPTER OPERATIONS and PERSONNEL SAFETY

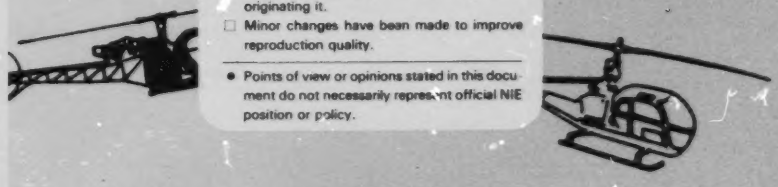
(Helirescue Manual)

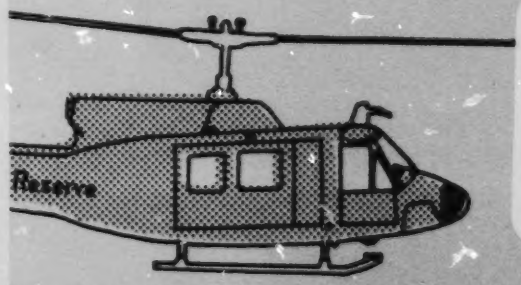




U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☑ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

RC014769





FOURTH EDITION
Includes
Fixed Wing SAR Operations and Ejection Seat Rescue

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Dene Dear
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

SURVIVAL EDUCATION ASSOCIATION

EMERGENCY RESPONSE INSTITUTE

9035 GOLDEN GIVEN RD., TACOMA, WASHINGTON

Thank you for inquiring about ERI materials and services. We have enclosed a packet of information as per your request, which will more fully explain our many functions and services.

ERI is a progressive thinking organization composed of diversified Emergency Response management professionals, who share a common goal. That goal is to make the citizens of this nation more self reliant and self sufficient in their everyday lives, regardless of what emergencies or inconveniences they may face. We believe that to accomplish this goal it will be necessary to change habits, values and attitudes toward emergency preparedness: in essence, create an ethic. It is to this end that we are promoting emergency preparedness and response education for all factions of our society nationwide.

As the term Institute implies in our title, we are dedicated to advanced study, research and instruction in the specialized field of emergency preparedness and response. As you will note in perusing the enclosed material, our accomplishments reflect the diversity of the services we offer.

Let us know how we can be of further assistance.

Patrick "Rick" LaValla

Robert "Skip" Stoffel

- Chairmen

BEST COPY AVAILABLE

HELIRESCUE

These guidelines are intended to assist ground rescue personnel in performing safe and efficient operations.

The helicopter has limitations. Search and Rescue personnel should always bear in mind this fundamental tenet in helicopter operations: THE PILOT HAS THE FINAL WORD. Only he best know the limitations of himself and his helicopter.

Suggestions, criticisms and information on new techniques and equipment would be appreciated.

The basic design and contents of this manual was developed and written by John Dalle-Molle, Mount Rainier National Park, Longmire, Washington 98397. We wish to acknowledge John's efforts with sincere thanks and appreciation.

June 1970
Revised June 1972
Reprinted April 1975
Revised October 1976
Reprinted December 1976
Revised October 1978
Reprinted October 1978
Reprinted April 1980

This guide available at quanity discount from:
Survival Education Association
9035 Golden Given
Tacoma, WA 98445
(206) 531-3156

ACKNOWLEDGMENTS

John Dalle-Molle, National Park Service
L. D. "Bill" Bridge, Superintendent, New Zealand Police Search and Rescue
Hall Foss, Washington State Department of Emergency Services
L.A. Johnson, Pacific Northwest Region, U.S. Forest Service
New Zealand Ministry of Transport
Rick LaValla, Search and Rescue, Coordinator, Dept. of Emergency Services
Royal New Zealand Air Force
Gerald Sabel, Seattle Mountain Rescue Council
Sequoia-Kings Canyon National Parks, Fire Control Staff
Sierra Madre Search and Rescue Team
Captain Tom Staadt and Fort Carson
U. S. Air Force - 304th ARRS
U. S. Army - MAST - 54th Medical Detachment, Major Maykuth; Captain Borders; Major Cloke; Major Lewis
U. S. Army - Fort Lewis - 9th & 10th AVN Bn, 9th Div.
U. S. Navy - Whidbey Naval Air Station
U. S. Coast Guard, SAR Operations, Seattle, Washington
U. S. Forest Service, Pacific Northwest Region
Washington National Guard
Washington Wing Civil Air Patrol
National Park Service
Yosemite National Park Fire Control Staff
CW_3 Ed Cleeves, SAR Officer, Ft. Lewis
Major Forest Kimsey, USAF
Lt. CDR. Ron Addison, USCG
Lois McCoy, NASAR
Art Jones, NASAR Aviation Committee
Marlene "Mickey" Norris, SAR Secretary, Dept. Emergency Services, Olympia, WA.

CONTENTS

	Page
Acknowledgements	1
Management	2-3
Safety Rules	3-6
Helicopter Request Information	7-9
Landing Areas	10-13
Evacuations	14-18
Rescuer Delivery	18-22
Crash Procedures	22
Wind Indicators	22
Communications	23-25
Night Landings	25-26
Patient Care	27-28
Appendix A Helicopter Description and Performance Guide	29-33
Appendix B Helicopter Capabilities and Limitations	34-36
Appendix C Basic Heliport Kit	37
Appendix D Equipment	38
Appendix E Selection of Landing Zones	39-45
Appendix F Uniform Grid Map System	46-48
Appendix G Air Transportation Agreement and Manifest	49
Guidelines for Military Aircraft Rescue	50
Military Aircraft Rescue	53
Guide for use of Aircraft in Support of Land SAR Operations	59

MANAGEMENT

Preparedness

Rescue organizations should work with available pilots for mutual training, understanding and to build confidence in each other's abilities. Those organizations that do not have regular association with helicopter units can usually work out agreements of cooperation with local agencies and companies who often have helicopters on contract, as well as the military. Whenever possible, organizations should have helicopters on contract agreement, so that requirements, limitations and expectations will be thoroughly understood.

Rescue Operation Leader

Should appoint a helicopter manager - someone trained and experienced in helicopter operations.

Operation leader should have alternate plans on-going in event helicopters cannot operate. Helicopter dispatch point may be weathered in; fuel caches may be water contaminated; slight icing may prevent flight. Never rely entirely on helicopters to do the job.

Helicopter Manager

1. Coordinates all aspects of helicopter operations between operation leader, rescue teams and pilot.

2. Whenever possible selects the type of helicopter and the pilot for the particular job. Experience and background knowledge is important. (See Appendix A).

3. Although the pilot will make the final decision as to the types of operations he and his helicopter can perform, it is important that the manager evaluate the seriousness of the situation in relation to potential dangers before requesting pilots to perform a particular activity. It has happened that requests to pilots inexperienced in mountain flying have unduly influenced them to take unnecessary risks.

4. Responsible for safety

   a) Uses only trained personnel to work with helicopter.
   b) Designates heliport area and clearly marks it.
   c) Keeps unauthorized personnel away.
   d) Maintains fuel sealed and in safe and dust-free area.
   e) Strictly enforces safety rules.

5. Confers with pilot to carry out any activities or provide any help requested, such as obtaining fuel, weather information, etc.

6. If pilot is not familiar with the operation area, should advise him of possible hazards, such as power lines. If manager is not familiar with the area, he should locate someone who is.

7. Briefs pilot on rescue situation, general plan of action and specific missions; anticipated operations at rescue site; topography; explains maps if necessary, and shows possible best route to scene. Agrees on radio call numbers, hand or other types of signals to be used. Advises pilot if trained helicopter crewmen are available.

8. If more than one helicopter is used, coordinates flights with pilots to ensure safety at heliport and helispots. Sets up definite traffic pattern at heliport.

9. Provides trained crew at all heliports and helispots to ensure safety, provide traffic control and assist pilots with loading and unloading of personnel, equipment and fuel.

10. Keeps operation leader updated on helicopter activities. If operations has contact with rescue scene, manager should ensure that personnel at scene know what may be expected of them in regards to helicopter operation.

11. If helicopter is working over distant and remote areas, manager should set up radio check schedule with pilot and obtain flight plan.

12. Manager may keep log of flight time.

SAFETY RULES

1. All personnel should stay at least 50 feet from small helicopters (2-3 place models) and 100 feet from larger models, unless directly part of the authorized crew working with the craft.

2. Always approach or leave the helicopter from near the front so the pilot can see you at all times.

3. Keep your head down at all times. Remember that the slower the rotor is moving, the lower it will dip.

4. Never approach or leave a helicopter from any side where the ground is higher than where the helicopter is standing - you may walk into a rotor.

5. No smoking within 100 feet of helicopters.

6. Remember that under many circumstances of visibility and viewpoint a helicopter tail rotor cannot be seen due to it's high speed. Maintain a wide clearance from the tail area and do not stoop or walk under the tail boom.

7. Personnel working with helicopter should wear hardhats with chin straps fastened, goggles and bright jackets or vests.

8. Passengers should wear hardhats with chin straps fastened at all times and seat belts secured until pilot oks removal.

9. Keep long handled tools, ice axes, skis, litters, radio antenna and similar items low and parallel to the ground when approaching or leaving helicopter.

10. Ropes should be coiled and secured. Loose, light items such as sleeping bags and parkas and small pieces of gear should be secured in packs or bags.

11. Do not load without pilot's supervision, as only he can best judge weight distribution and proper tie-down methods. Keep tie-down straps short to eliminate loose ends which might get tangled in control cables or motor. Re-secure tie-down straps after unloading.

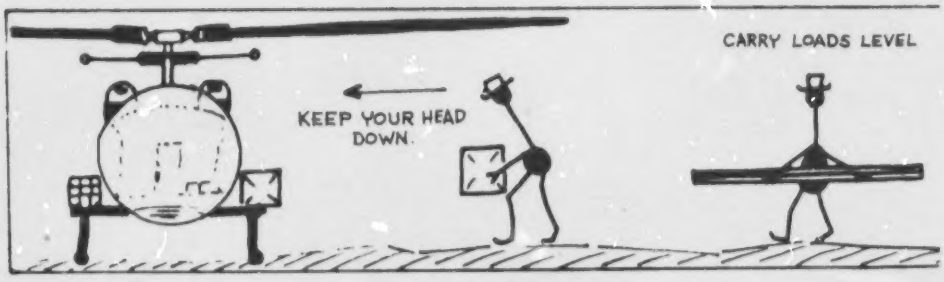
12. Passengers should not enter helicopter until pilot gives ok. Enter carefully so not to interfere with controls, cables and pilot.

13. Do not exit until pilot gives ok. Ground personnel should not approach helicopter until engine is off and rotors stopped or pilot signals ok. Even after touchdown pilot may want to shift helicopter's position.

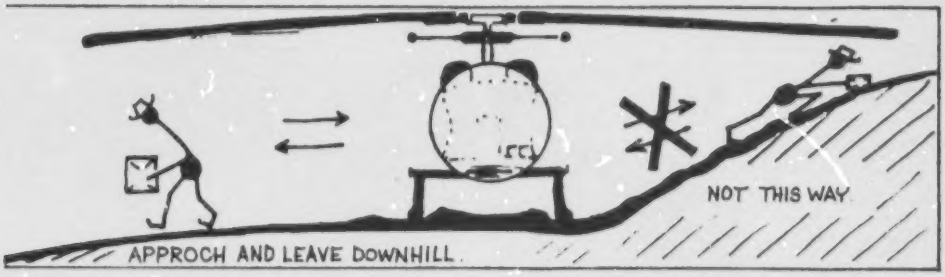
14. Never stand directly beneath helicopter or its take-off or landing pattern unless directly authorized to hook sling loads.

15. At takeoffs and landings all personnel should be well away from helicopter. Main rotors may dip to one side as craft moves and tail rotor may swing around. Trained crewmen should be in control to signal pilot and keep personnel away.

SAFETY TIPS



LEVEL GROUND



SLOPING GROUND

IF DIFFICULT TERRAIN WAIT TILL THE SKID IS FIRMLY ON THE GROUND...
← AND PILOT SIGNALS "OK TO BOARD"
GET IN AND FASTEN YOUR SEAT BELT.

Figure 1

BEST COPY AVAILABLE

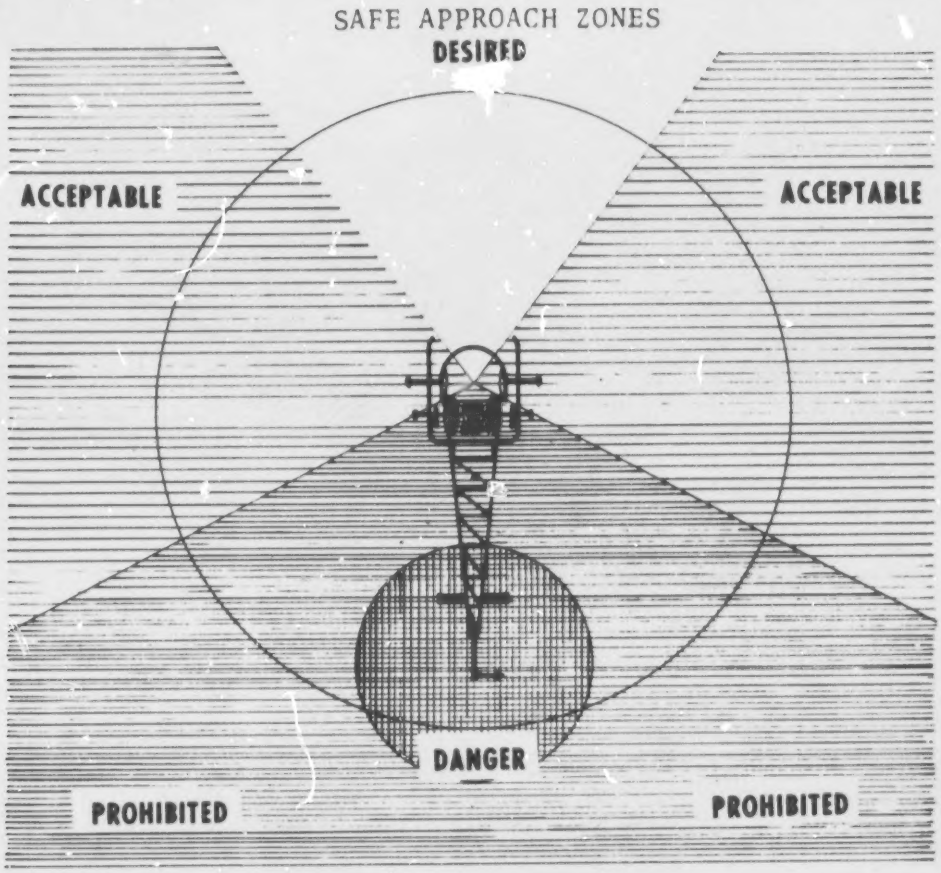


Figure 2

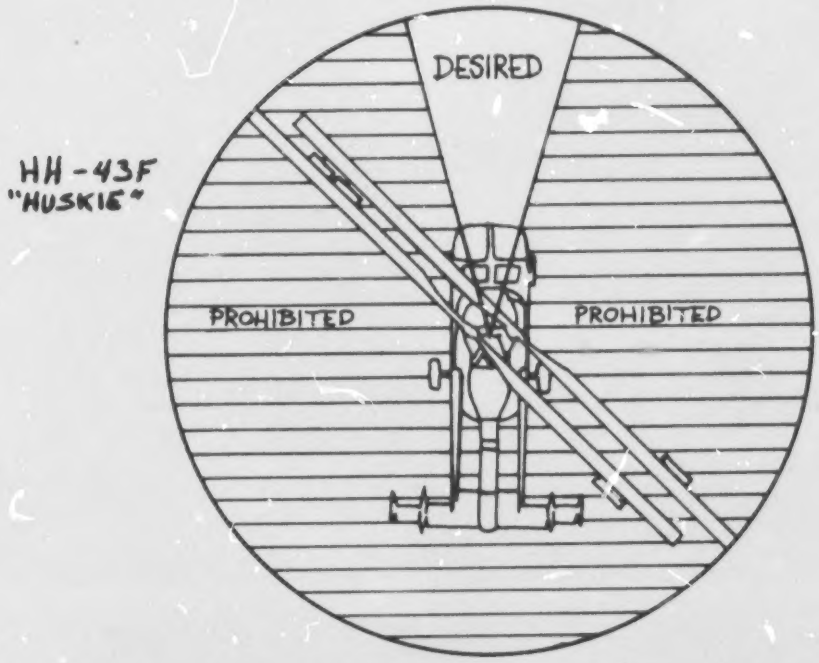


Figure 3

BEST COPY AVAILABLE

HELICOPTER REQUEST INFORMATION

1. Objective

   a) Type of operation. (Search, rescue, medical evac...)
   b) Number of victims or rescuers to be transported.
   c) Extent of injuries. (Prevent self-movement?)
   d) Disposition of victims. (Transport to...?)

2. Location of Incident Site/Heliport

   a) Geographic coordinates and/or any other means of location using a magnetic radial from or a magnetic bearing to a navigational facility or significant landmark in nautical miles if possible. Any location information will be helpful. Nationwide Uniform Map Grid System is best for military helicopters. (See Appendix D)

3. Description of Incident Site/Heliport

   a) Type of terrain. (Mountainous, forest, desert, water...)
   b) Elevation - feet above mean sea level. (Hover capabilities and limitations must be considered.)
   c) Size and condition of landing area. (General statement of diameter, surface conditions - rocky, sandy, snow, sloping, smooth...).
   d) Obstructions to landing or hover. (Height in feet above objective and distance and magnetic direction, i.e., 100 foot tower 300 feet SSE of incident site. Transmission lines, trees, peaks, etc.)

4. Weather at Incident Site/Heliport

   a) Ceiling. (Height of lowest clouds above ground - in feet).
   b) Visibility. (About how far you can see. Include restrictions such as rain, smoke, fog, haze).
   c) Wind direction in degrees magnetic and velocity. Gusts, turbulence.
   d) Temperature in degrees centigrade or fahrenheit (specify) or best estimate.

REQUEST FOR MILITARY AIR SUPPORT

SAMPLE SHEET

State DES #_____ Date:_____ Time:_____

Federal #_____

NOTE: For time-critical medical-evacuation of known victim, call "MAST" Direct.

FILL IN PROPER & CURRENT PHONE NUMBERS

U.S. Army, Ft. Lewis, MAST: (206)967-5405 _____
U.S. Army, Yakima Firing Center, MAST: (509) 453-5551 - Ext. 479 _____
U.S. Air Force, Spokane, 48th ARRS, MAST: (509)247-2207 or 247-2151 _____
U.S. Coast Guard, Port Angles or Astoria: 442-5886 _____
U.S. Navy, Whidbey NAS: 257-2681 _____
U.S. Air Force, Portland, ARRS, MAST: 288-5611 - Ext. 315 or 316 _____

1. Call Dept. Emergency Services Duty Officer: 1-206-753-5990, request Air Support.

2. Give-- Your name; Agency; Telephone Number.

3. SAR Objective: VEHICLE_____ PERSON_____

   BOAT_____ OTHER_____

4. REMARKS: Describe situation requiring Air Support, non-availability of medical or ambulance facilities.

   Are other land transport or local resources usable? NOTE: Insure that commercial land or air resources are not available, timely, or unqualified for mission._____

   _____

   _____

5. Victim Information:

   Name:_____ Age:_____

   Address_____

   Last known position: SEA GRID_____

   LAT./LONG_____ Time:_____

   Destination_____

   Condition (Description of injuries)_____

   _____

6. On-Scene Situation: Give as much information as possible. (Who is on scene? How many? Qualified Medical personnel on scene?)

   _____

7. Pickup Area:

Weather:_____ Temperature:_____

Elevation:_____ How Marked:_____

Helipad or Landing Zone Location:_____

Wind (velocity/direction):_____

8. Delivery Area:

Location:_____ How Marked:_____

Weather:_____ Temperature:_____ Wind:_____

9. Air Miles Delivery Area to Pickup Area:_____

10. JP4 or JP5 Source:_____

11. Medical Information:

On Scene Physician: NAME_____
TELEPHONE_____

Receiving Physician: NAME_____
TELEPHONE_____

Location/Agency:_____
TELEPHONE_____

Special medical equipment required?_____

_____

12. On-Scene Communications:

Type: (AM or FM)_____

Frequency:_____

CB Channel:_____

LANDING AREAS

SELECTION OF LANDING ZONES

(Refer to Appendix E)

Heliports

Base of operations for one or more helicopters must be accessible by road, have ground level fueling facilities, wind indicator, fire protection, dust-free landing pad and parking area for vehicles and helicopters. It may have lights, telephone and radio communications and storage facilities for equipment that will be secure from unauthorized personnel. It is desirable to have barricades and signs around the area to keep unauthorized personnel out.

It is helpful if the heliport and the base of rescue operations are in close proximity.

Helipad (landing zone)(LZ)

Any designated landing spot for helicopters. Distinguished from heliport by lack of road access for fueling and supply.

A helipad consists of a landing area cleared to safely accomodate helicopter on the ground and clear landing and takeoff lanes. Wind indication should be provided by use of panels in a "T" formation with the top of the "T" in the direction of the wind. Touchdown pad should be level and firm, clear of any loose debris which might fly up and into the main or tail rotor system.

Locations

Ridges

1. The best helipads are located on exposed areas. This gives a 360 degree choice of landing and takeoff directions.

2. Preferably choose a spot where a dropoff is possible for takeoffs. The higher the elevation, the more important the dropoff becomes. - If a helicopter has to make a vertical takeoff, (no drop-off), it does so on power alone. But with a dropoff the aircraft has the advantage of using less power, to carry a larger payload and has the ability to a greater safety margin.

3. Locate helipads so that landings and takeoffs can be made into the prevailing wind. The higher the elevation, the more important this is.

4. Remove all obstacles such as brush and trees within at least a 50-foot diameter around the touchdown pad for small helicopters and at least 100 feet for larger models.

5. Be sure to clear landing and takeoff lanes.

6. Make touchdown pad level and at least 15 x 20 feet for small helicopters. The pad should not slope more than 8% as a general rule. Reason: Different helicopters have different slope landing capabilities. Considering the difficulty of measuring slopes accurately, 8% should cover all helicopters and errors in measurement. Also, certain wheel equipped helicopters (the Army CH-47 for instance) are able to land on steeper slopes than skid types.

Level or Bottom Lands

1. A truly vertical takeoff should not be considered safe at any elevation. Remember that a small helicopter must be at least 300 feet above ground to autorotate safely.

2. Be sure takeoff path is into prevailing wind. Avoid "dead air" or downdraft spots, such as areas on the lee side of ridges.

3. The safest takeoff path in a level or bottom land situation should be at least 300 feet long and slightly downhill.

4. Be sure the helicopter has some place to go when it gains forward flight at the end of the takeoff path.

NOTES

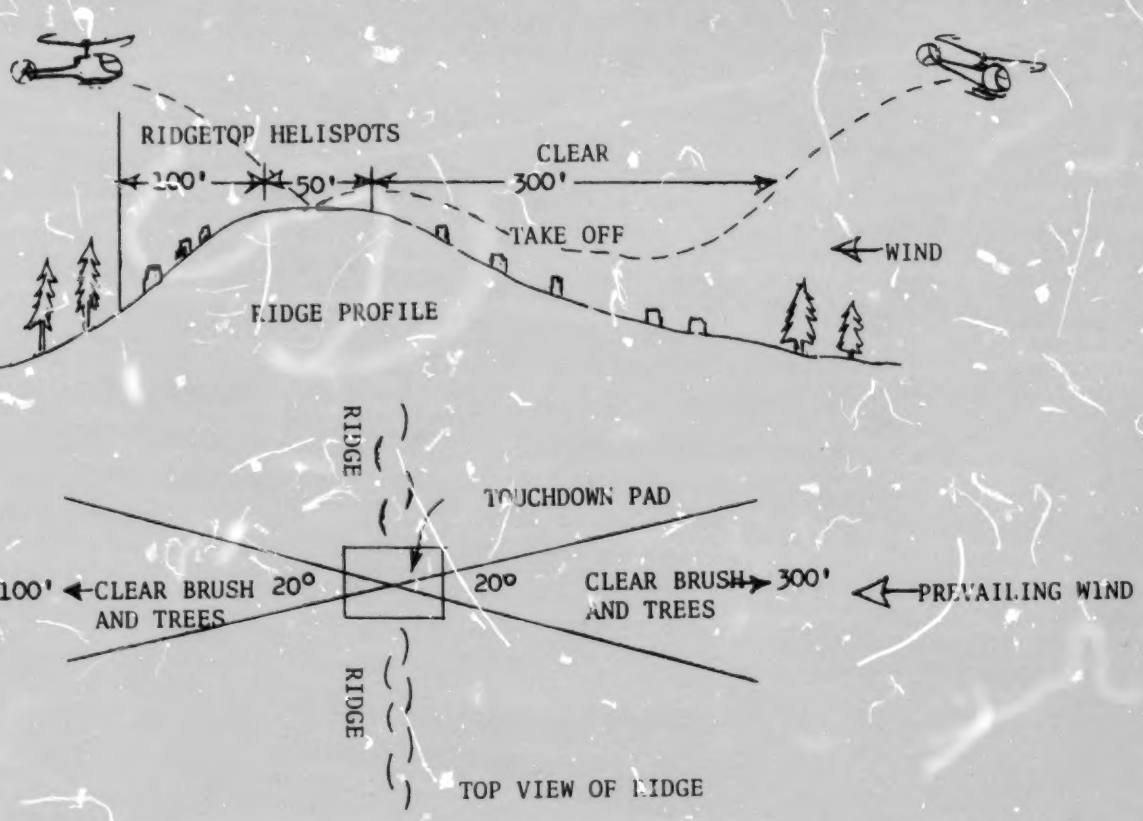


Figure 4

Lakes and Rivers

1. Water furnishes a poor ground effect base for hovering. River currents move ground cushion and can cause pilot disorientation. If a helicopter is operating from a helipad on shore it may need at least 300 feet of water over which to gain flying speed.

2. Ice locations should be used only if no other locations are available. There are many variables over ice: unevenness of thickness, overflow, shell ice with air pockets, snow covered but unfrozen water. Avoid outlets or inlets.

   Many pilots will not land over ice locations without prior inspection but may hover with skids or wheels just touching. Sudden wind gusts or loss of power could be disastrous and snow blown by rotor wash creates visibility problems. Experienced ground crews should be available if such an operation is a necessity.

Canyon Bottoms

1. Beware of dead air holes and be sure the canyon does not have downdrafts from neighboring ridges.

2. If the canyon is deep, the helicopter will need a long forward run to pull out or a wide enough area in which to circle to gain elevation.

Meadows

Beware of meadows with high grass. The grass will tend to dissipate helicopter ground cushion. High grass may also hide rocks, logs, swampy areas. Dry grass can be a serious fire hazard.

Roads and Trails

A straight, wide (consider rotor diameter) down-road stretch is best, as most power failures occur during takeoff. Turn-outs or parking areas with dropoffs can also be used. Beware of Power Lines or Telephone Lines which normally follow roads - advise the pilot if any are in the area.

Snow and Glaciers

1. Depth perception on snow and glacial ice is often poor, so it is important to clearly mark helipads with objects of contrasting color. Wands about 3' high with streamers attached, packs, tarps (securely anchored), tramping a trench to create shadows, spray painting, signal panels, or smoke grenades are some methods.

2. If conditions are icy, remember that slope landings become increasingly difficult and be prepared to offload/load the helicopter from a low or one point hover if the slope approaches a maximum of about 8%. Smoke grenades will provide an excellent indicator of landing conditions and may stain the ice to provide a semi-permanent reference. Helicopter should have ice pads and skids and a pilot experienced in glacier landings. Reason: Increased safety for all personnel.

3. On icy surfaces stay well clear of helicopter during landings and takeoffs - torque may cause the tail rotor to swing around.

4. Be sure helipad is large enough to keep main and tail rotors from striking seracs and pressure ridges. Keep touchdown pad off of snow bridges, thinly covered crevasses, crust and cornices.

5. In loose snow, smoke grenades, flares, wands with fluorescent streamers may help guide pilot when rotor wash creates blowing snow. Every effort should be made to tramp helipad firm. Loose snow may cause the pilot to lose sight of the

touchdown area; do not stand in front of a helicopter when the pilot is trying to land in loose snow.

6. During landings in loose snow, stay clear until pilot gives ok to approach or exit. Should helicopter settle further in snow than pilot expects, the rotor may come down on you.

HELICOPTER EVACUATIONS

Helicopters can make pickups in two basic ways: by landing at or near the distress site and by making a hovering recovery. The last is hazardous even under optimum conditions and experienced crew; and in the conditions of mountain operations most evacuations should be by landing. In most mountain rescue situations there is time to even construct a safe helipad rather than try hovering recoveries.

Under the noise and excitement of a helicopter evacuation medical problems of the victim can be increased due to fear and uncertainty. In addition to the usual reassurances given by rescuers to victims, information should be added about what is to take place regarding the helicopter pickup. Be sure you have assessed the victim's state of mind and are confident (as is humanly possible) that he can take the strain of the pickup. Provide for wind and cold protection.

Voice communications with the pilot or helicopter crew may be very difficult. If you do not have radio communications tag the victim with information on medical treatment given, where he is to be taken, etc. In a complicated mission it is well to have notes to the pilot or crew pre-written to avoid delay.

Evacuation by Landing

Locate a safe helipad (see "Landing Areas"), approach the aircraft from the front (see figure 3).

Evacuation While Hovering

Carried out by hovering over party and taking him aboard by using a hoist with basket, litter or sling; by loading litter on, or by climbing aboard.

The factors to be taken into account in selecting a site for a hovering recovery are generally the same as those for selecting a helipad (see page 8) except a smaller ground area, rougher terrain and steeper slope are permissible. On the other hand, it is extremely important that there be plenty of room for both the main and tail rotors, as pilot may have to turn the helicopter if there are wind changes. Wind

conditions and density altitude may prevent safe hovering but only the pilot can be the judge. Wind indication at the site may be very important in helping the pilot make a judgment. An experienced hand signaler, that the pilot knows is competent, should be at the site. All ground activities should be directed by an experienced person and all personnel should be within the pilot's view at all times.

1. Hoist Evacuation

The use of sling (horse collar) may be difficult if victim is not assisted by trained ground crew. Use of the basket is preferred, particularly when victim is injured. The excitement of a sling hoist may increase shock or heart problems and in cases of chest, arm or shoulder injuries further damage may be done. Victim can slip out of the sling.

Helicopters with hoist mechanisms are not common and some of these have very limited operational ceilings for mountain work. The helicopter crew must be proficient in the operation of the hoist and the mechanism must be in top shape.

Maximum load on most military hoists is 600 lbs. Some commercial models are less. Length of cable varies from 100-250'. It is preferable to hoist one person at a time, due to problems with center of gravity and getting persons inboard.

There should be enough ground area clear of obstacles such as trees, brush, rocks, and seracs so that the victim is not injured or entangled before he can be hoisted clear. Remember that there may be some penduluming motion while victim is being hoisted, so provide sufficient clear area, usually 50' diameter at least. A trained hand signaler should be on site to signal pilot and hoist operator.

a. Sling (horse collar) - 1. Let sling touch ground to get rid of static electricity. 2. Place sling over head and shoulders, under armpits with the hoist cable in front of person being hoisted. 3. The person should hold the sling just below the cable hook to prevent hook from slipping into face when tension is placed on the cable. The cable hook should be just above eye level when the cable is taut. Caution: Individuals circulation can be restricted during this operation, thus causing loss of feeling, thereupon, chest, arm and individual could slip from the harness.

b. Monkey suit - a nylon mesh jacket with legs and arms cut off. 1. Place feet through leg holes, then arms through arm holes. 2. Buckle chest buckles. 3. Be sure crotch and chest slings are secured to ring that will connect with hoist hook. Victim cannot come out of this. While getting into this unclip it from hoist so helicopter is not tethered to ground while waiting.

c. Forest (Jungle) Penetrator - 1. Let it touch ground to get rid of static electricity. 2. Pull one of the three plates near the bottom down (it is marked "pull"), this is the seat. 3. Pull velcro tape at top (or zipper) -- this is the sling which goes on as in (a) above. 4. Sit on seat and wrap arms around penetrator portion in front of chest. (Because cable may rotate rapidly during hoist keep hands away from cable and damper assembly -- portion joining cable to penetrator).

d. Water basket - 1. Let it touch ground. 2. Victim climbs or is placed inside. Keep hands inside. (In cases of severe or disabling injuries it is usually preferable to use a stokes or jakes litter).

e. Stokes litter - 1. Rig as for cliff evacuation keeping rigging short (3') so litter can be hauled inboard. 2. Be sure load is balanced (pivot point over chest usually). 3. Tie victim in.

If a litter is being lowered from a helicopter hoist: 1. Allow it to touch ground. 2. Place victim in, strap in. 3. If it is necessary to take the litter away from the hoist point or if it will be a long time until the patient can be placed inside, unhook the litter from the cable and leave it free for the helicopter to haul in or move. Do not attempt to move the litter without unhooking.

If a trail or tending line is dropped by the helicopter, guide the litter down and then again when hoisting up. Keep the line free at all times. This line will not cause static electrical shock.

FOREST PENETRATOR

WARNING

Because it is characteristic of the hoist cable that it will rotate rapidly when the hoist is loaded, hands should be kept away from the cable and the damper assembly.

Figure 5

Jakes litter and similar ones designed for helicopter work are suitable for hoist operations and the technique is the same as for the Stokes.

Two piece stokes, akias, banana boats (sled boat-plastic) and similar litters are not recommended for hoist evacuations.

Do not attempt to use cargo hooks or bomb shackle assemblies for evacuations of living victims, as these are subject to many human errors and mechanical failures.

2. Litter Tie-On

If a hovering or one skid evacuation is necessary with a litter patient and the helicopter can be so equipped, use the following: 1. At the heliport secure a litter (litter #1) to the skid (but not with the litter safety straps). Leave the safety straps fastened in such a way that they can be easily undone. 2. At arrival on the scene the straps are unfastened and a second litter (litter #2), of the same type as litter #1, with the victim in, is placed in litter #1. 3. The safety straps of #1 are placed over #2 and the victim. This both secures the two litters together and the victim in. Only a well trained crew should use this method.

In such loading both lateral and longitudinal centers of gravity must be considered. Rescuers at scene should advise pilot of approximate weight of victim and any gear going with him, so that pilot can plan on any ballast that may be needed. (A rescuer may have to be ready to ride back as ballast.)

When securing litter #1 to helicopter use short tie-on to prevent loose ends getting in cables or rotor. (2' pieces usually suffice).

3. Boarding Hovering Helicopter (Skid Models)

The use of this method with small helicopters where lateral balance is critical is hazardous and it is difficult to find situations in which the risk to helicopter and personnel would justify its use. In the event this operation is performed, personnel should know the technique for boarding during one skid operations (see "Boarding")

RESCUER DELIVERY

If a landing site is not available, other methods are possible to deliver rescuers to the ground:

a) Hoist Lower - Personnel lowered by power wench on cable. Trained helicopter crew needed. Before requesting helicopter with this capability check on effective operational ceiling, as some of the helicopters with hoists cannot operate at very high elevations.

b) One-Skid Landings - Touching down to load or unload passengers and/or cargo, but retaining lift by the rotors so that the full weight of the helicopter is not resting on the ground. Pilot and rescuers must be trained in this technique.

Passenger Unloading

1. Pilot touches down skid on passenger side.

2. Upon nod from pilot, unfasten belt and move smoothly onto skid. Do not step between ship and skid but merely step off beyond skid.

3. Remain in low crouch within pilot's vision and hand signal takeoff. Remain in crouch until helicopter is clear.

4. If terrain rises in front or is precipitous do not move but remain low near skid until helicopter is clear.

Cargo Unloading (external racks):

1. Do not lean or step over skid as cargo is unloaded in case a gust of wind forces sudden takeoff.

2. Unload symmetrically. If only the pilot is aboard, unload items on the rear of the cargo racks and progress to the front. If passengers are aboard, unload cargo from front of rack and progress to rear. Be sure to re-secure tie-down straps.

Boarding

1. Move close to the skid and keep your eyes on the pilot. Do not attempt to board until you receive a nod from the pilot.

2. Upon signal, lean over the skid and grasp the door frame. Place your left foot on the skid and transfer weight slowly. Keep your weight in toward the cockpit--do not land in the door with your weight concentrated outboard. Make your legs do the work--move slowly and evenly into the cockpit. Do not switch feet on the skid; once your left foot is on the skid your right foot should follow on through to the cockpit floor.

3. Immediately fasten seat belt.

c) Helijumping - Exit from an airborne helicopter without any restraint to free fall. It can be executed from a hover position or when the helicopter is moving slowly.

This technique has proven useful at times in forest fire work and in some rescue operations. It is not recommended except in critical situations and under optimum conditions with pilots and rescuers trained in its use. On skid model helicopters a jump step and signal light should be installed.

Technique (skid models):

1. Heliport - remove door on jumper's side. Pilot and jumper agree on signals to be used.

2. Jumper - does not wear any loose equipment. All gear is placed in pack to be dropped at site. Wears hardhat, preferably crash helmet or high quality climber model, chin strap fastened. Wear gloves and thick-soled, sturdy boots. If jumping into vegetation should wear smokejumper's protective suit, including face guard.

3. Jump spot - both pilot and jumper agree on the jump spot. The helicopter should be able to reduce speed to 10 mph or less. Maximum safe jump height is 10' above ground. Flat, open, bare areas are best. Watch for hidden rocks, logs, uneven ground, sharp stubs, thin snow-layer hiding rocks, crevasses and icy or very compact snow areas with more than 15% slope and adjacent exposure. Crampons should not be worn due to hazard of twisting an ankle. Areas of scree or rotten rock should be avoided.

   If jumps into vegetation are necessary the vegetation should not be higher than 8' (helicopter will be at least 2' above the canopy). Avoid vegetation with excessive visible dead material. Choose a green patch, avoid large limbed trees and remember that dense vegetation may hide rocks or logs. Thin limbed trees and brush, such as green saplings and reproduction are best.

   On non-icy slopes choose a slope under 60% where the helicopter can contour the slope. The jumper must be on the uphill side. Avoid slopes with exposure adjacent below.

4. Jump procedure - four passes will be made at the jump spot:

a. The first pass is a high level reconnaissance for the purpose of selecting the jump spot. Over snow or ice with flat light conditions a dark object should be dropped for reference (see Snow and Glaciers, page 11).

b. The second pass will familiarize the pilot and jumper with the proposed spot. This is a low-level pass similar to the actual jump pass. During this pass take note of the cover, slope, hazards.

c. The third pass is the equipment drop. Flag gear with bright streamers for easy location.

d. Jump pass:

1) When making the approach for the jump watch the pilot. His instructions will be the deciding factor. Signals between pilot and jumper should be set in advance and clear. Upon signal the jumper unfastens seat belt, tucks it away from catching on clothing.

2) Jumper pivots on seat, extends feet outward to the skid and assumes a standing position on the jump step, maintaining balance by leaning back against the cockpit and holding onto the door frame.

3) When the helicopter is in the jump position the pilot will give the go signal. Jumper simply steps off to avoid a springboard effect and drops to the ground. Avoid sudden weight changes when exiting, do not spring, but gently roll off so little recoil will be felt by the pilot. Keep legs together and make a parachute landing. Remain prone until helicopter is clear.

4) Do not jump without the go signal from the pilot. He may be experiencing difficulty unknown to the jumper. If the go signal is not given and the pilot accelerates to climb away the jumper must return to the cockpit immediately. This is perhaps the most dangerous phase of the operation and the following should be learned carefully:

From position on the skid, place left foot behind you and lock the heel over the metal strip that runs along the edge of the cockpit bubble where it joins the floor. Using this Foothold, ease back into the cockpit and fasten seat belt. At no time should either hand release grips on the cockpit frame.

CRASH PROCEDURES

Crash situations are rare but chances of survival are greatly increased by following these rules:

1. Keep safety belt tight at all times.
2. Keep hardhat on and chin strap fastened at all times.
3. Throw out heavy gear only if instructed by crew.
4. If instructed by the crew that the aircraft is undergoing an emergency assume the following position:
   (a) Bend forward at the waist with feet planted firmly on floor.
   (b) Rest chest on knees and enfold and lock the arms around and behind the thighs.
5. Remain seated with seat belt on until rotors stop.
6. Do not leave the aircraft until instructed unless fire or other circumstances force such action.
7. Remain well clear of aircraft after exiting and do not return to recover equipment left behind.

WIND INDICATORS

Under the difficulty of mountain operations, providing indication of wind direction and velocity to pilots is one of the most valuable tasks ground personnel can perform. Throwing dirt or snow in the air, holding up light material or streamers will help. Smoke is best and all rescue teams normally will be equipped with smoke grenades. A plentiful supply should be carried, as wind patterns may shift and some pilots will like to have wind indication each time they land or take off.

Smoke should be kept downwind from the helipad and to one side of the approach pattern so that it does not obscure the pilot's vision. If the helipad is in a depression or hollow keep the smoke outside. If wind is light (under 10 mph) and variable, smoke may obscure the helipad and be more of a hindrance than help and should not be used. Remember that certain types of grenades, such as the military M-8 cannot be hand-held due to heat.

Streamers or plastic ribbon flagging in bright colors may be tied to rocks, bushes, trees, or poles. If only streamers are available try to have one about 8' long on a 20' pole. Wrap others around the pole so it will be easily visible to the pilot. Have wind indicators as close to the edge of the helipad as is safe, so the pilot gets a true picture of the currents at the site, but not in the takeoff or landing path (bear in mind rotor diameter). Secure 2-3' streamers to the ground on the helipad--helicopters have been dumped just as they touched down by gusty ground currents.

If no other means are available hand signals should be used.

Rescue teams can have prepared equipment ready to drop over sites if needed. These can include rocks, pipe, wood blocks with streamers attached or smoke grenades.

Hand Signals

These can be of great assistance to pilots but it is important that anyone executing them be thoroughly trained. A wrong or poorly executed signal will confuse the pilot. The pilot should be informed beforehand that a trained signaler is available and the types of signals he uses. The pilot may choose not to utilize his services. (See page 24)

Radio

Helicopters equipped with radio may not have the same channels as rescue unit radio. Rescue unit should have portable with headset (preferably crash helmet wired) ready to use on the helicopter. During critical maneuvers (hover pickup) helicopter manager or communications officer should clear the air except for transmissions critical to the pilot.

Message Drop Kits

These can be made in a variety of ways; must be heavy enough so they would not go up into rotor or be blown back into tail. Federal agencies can order from GSA. Ground to air signal panels should be on hand to drop with kits if two-way communication is needed.

Loudspeakers

Though some helicopters are equipped with loudspeakers, portable powered bullhorns can be used on unequipped helicopters, though it may take a little practice to be effective. Loudspeakers can be especially helpful when directing searches.

HELICOPTER SIGNALS

THESE SIGNALS ARE ADVISORY AND THE PILOT IS UNDER NO OBLIGATION TO OBEY THEM. CONDITIONS BEYOND THE CONTROL OF THE PILOT OR FACTORS UNKNOWN TO THE GROUND SIGNALMAN MAY MAKE IT NECESSARY OR ADVISABLE TO DISREGARD THE SIGNALS.

☆ *WHEN THESE SIGNALS ARE USED IT IS IMPORTANT THAT THE SIGNALMAN POSITION HIMSELF BEYOND THE PATH OF THE MAIN ROTOR WHERE HE MAY BE READILY OBSERVED.*

CLEAR TO START ENGINE
MAKE A CIRCULAR MOTION ABOVE HEAD WITH RIGHT ARM

HOLD ON GROUND
EXTEND ARMS HORIZONTALLY, THUMBS POINTING DOWN

CLEAR TO LIFT
EXTEND ARMS HORIZONTALLY, PALMS UP.

MOVE THE HELICOPTER BACK
EXTEND ARMS FORWARD AND "PUSH" THE HELICOPTER AWAY

MOVE THE HELICOPTER FORWARD
EXTEND ARMS FORWARD AND WAVE THE HELICOPTER TOWARD YOU

MOVE TO SIGNALMAN'S RIGHT
EXTEND RIGHT ARM HORIZONTALLY AND MOTION TO RIGHT WITH PALM OF LEFT HAND

MOVE TO SIGNALMAN S LEFT
EXTEND LEFT ARM HORIZONTALLY AND MOTION TO LEFT WITH PALM OF RIGHT HAND

RELEASE SLING LOAD
CONTACT LEFT FOREARM WITH RIGHT HAND, PALM EXTENDED

CLEARED FOR TAKE OFF
EXTEND BOTH ARMS ABOVE HEAD, THUMBS UP

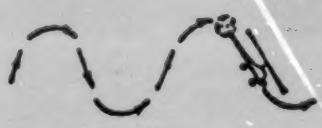
WAVE OFF, DO NOT LAND
WAVE ARMS FROM THE SIDE HORIZONTALLY TO OVERHEAD

LAND HERE, MY BACK IS INTO THE WIND
EXTEND ARMS TOWARD LANDING AREA WITH WIND AT YOUR BACK

SHUT DOWN
CROSS NECK WITH RIGHT HAND, PALM DOWN.

INDICATE WIND DIRECTION (CIRCLE)

NO (YAW BACK AND FORTH)



YES (PITCH UP AND DOWN).

Figure 6

BEST COPY AVAILABLE

Ground to Air Signals

Orange or yellow are standard colors for panels to attract or signal aircraft. However, under conditions of red, brown or sandy rock or soils, white is often easier to see. Fluorescent colors are best. Panels 12' x 10" have proven exceptionally good. Below are standard signals on easily carried wallet card.

MOUNT RAINIER NATIONAL PARK
GROUND TO AIR/AIR TO GROUND SIGNALS

International Distress Signal	SOS
Ground to Air	
Require Doctor, or have a serious injury at scene	I
Require Medical Supplies	II
Unable to Proceed	X
Require Food & Water	F
Require Map, Compass, & Direction for Escape Route	□
Require Signal Lamp with Battery & Radio	— —
Indicate Direction to Proceed	K
Am Proceeding in This Direction	→
Require Stove & Fuel	L
All Well	LL
No	N
Yes	Y
Not Understood	⊥L
Able to Ride Horse	1
Need Stretcher Crew	2
Broken Leg	4
Broken Arm	3
Broken Back or Neck	6
Head Injury	7
Frostbite Case	0
Internal Injuries	8
Unable to Diagnose	9
Drop Cargo Here	T
Helicopter Landing Site	H
Received Message	Wave Streamer Each Time
Air to Ground	
Will Drop Message	Gun Motor 3 Times
Received Message	Rock Plane
Fire or Other Location Here	Circle 3 Times

GJB/CRO 11-1-65

GPO 989-619

NIGHT LANDINGS

Night operations are becoming more common with the availability of fully instrumented helicopters. In mountain operations it is extremely important to have good communications with the pilot and advise him of optimum flight paths to avoid hazards, such as trees, peaks, ridges and especially power lines. Even in the mountains a pilot may have difficulty in locating the site because

BEST COPY AVAILABLE

of campfire or auto lights. A brightly flashing strobe light or emergency vehicle lights are good. Tell the pilot what to look for. Once the helicopter is coming in for final approach put out all lights except any needed to mark hazards or touchdown pad. Fluorescent panels or bright plastic, well anchored, can mark the touchdown pad. Any lights on the pad must be kept low (such as vehicle lights on low beam) so they don't blind the pilot's vision or flood the instrument panel. At no time must lights shine on the helicopter.

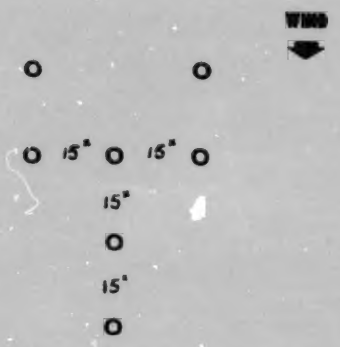


Figure 7

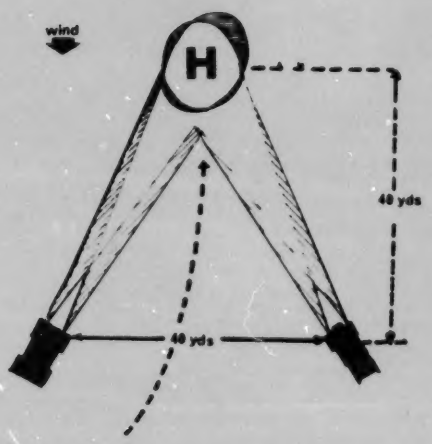


Figure 8

BEST COPY AVAILABLE

When the helicopter is being used as an air ambulance there are a number of patient care and evacuation procedures that should be considered that may differ from the usual methods used for on-the-ground evacuations.

If the patient will be transported on an externally mounted litter or if a hoist will be used, keep in mind the following:

a) Prior to the arrival of the helicopter the patient should be informed of the method of his pending evacuation and he should be made aware of the noise, wind and turbulence factors that may be expected.

b) The patient must be well secured in the litter. His hands must be completely restrained to prevent him from reaching outside the confines of the litter.

c) Face and eye protection should be applied to the patient to prevent further injury by blowing debris caused by rotor wind.

d) When transporting a patient on an externally mounted litter he should be loaded with his head forward so he may be observed at all times. A face shield should be applied to permit proper respiration without the influence of rotor wind. When leaning out to observe or work on the patient be sure seat belt is secure as well as helmet, goggles or eyeglasses that could be blown off into the rotors.

Additional Procedures:

1. The patient should not be placed unattended in the cabin of a helicopter unless he is restrained.

2. Cabin temperature decreases as flight altitude is increased. Normally cabin heaters are adequate to compensate for this, but periodic assessment of the patient's thermal comfort should be made and blankets, etc., provided as required.

3. If pneumatic pressure splints are used, they should be monitored as to adjustment due to pressure changes associated with altitude. Additional precautions must be taken during cold weather to insure against frostbite because of the reduced circulation caused by the pneumatic splint.

4. The potential for airsickness and subsequent vomiting is enhanced by the presence of injury, illness or apprehension. Observe the patient closely for the development of this complication, especially if unconscious. Be prepared at all times to restore an adequate airway through removal of vomitus, etc.

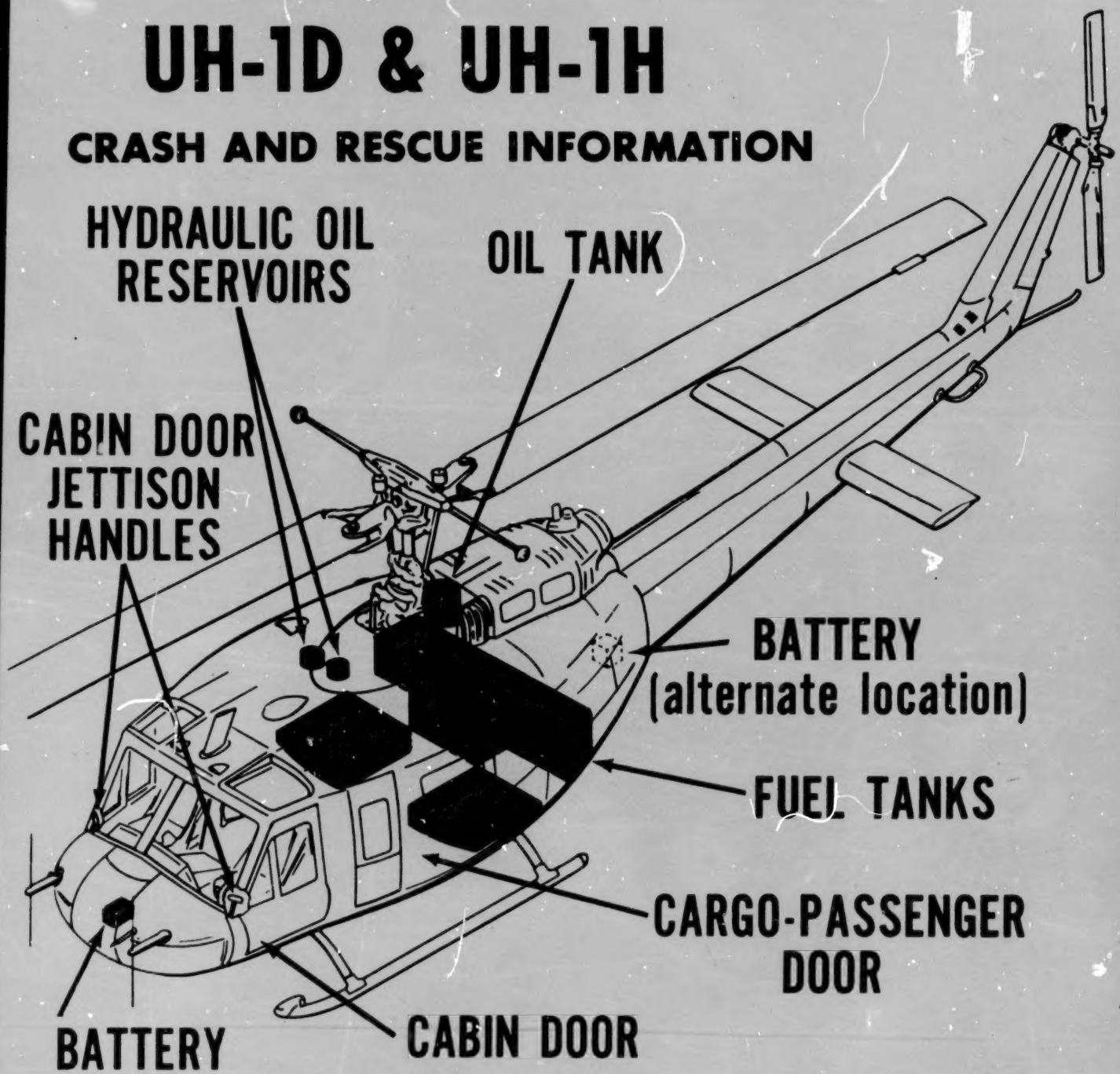
5. If at all possible, intravenous (IV.) fluids should be started before becoming airborne. Once airborne starting an I.V. is complicated by the vibration and turbulence of flight.

6. Before transferring the patient, assure that he is tagged and indicate extent of injuries, tourniquet, vital signs, drugs or medications administration, amounts and times.

NOTES

UH-1D & UH-1H

CRASH AND RESCUE INFORMATION



- To gain entrance to cabin, slide or break either cabin door window and pull jettison handle.
- If cabin door fails to jettison or cargo-passenger door fails to open, break windows or windshield.

ALL OTHER HELICOPTERS

Beware of fuel, oil, and hydraulic tanks.

Same entrance procedure applies to most helicopters.

Approach all from side.
Read rescue instructions.

FT RUCKER 02347

BEST COPY AVAILABLE

HELICOPTER DESCRIPTION and PERFORMANCE GUIDE

APPENDIX A

Descriptions specify standard configurations based on 1971 manufacturers data.

Ceiling IGE - In ground effect hovering ceiling in calm standard atmosphere. w = with. Thus the Alouette II can hover IGE with 1660 lbs. of useful load at 8,000'. Remember that to hover IGE the helicopter must be able to get near the ground a distance not exceeding the radius of its main rotor.

Useful load - (Fuel, oil, passenger/cargo, pilot). Is established by subtracting the empty weight of the helicopter from the certified gross weight. The useful load of each individual helicopter varies somewhat from the published figure because of radio and other equipment installed in it.

At no time should the combined weight of the pilot, fuel, oil, passengers/cargo exceed the useful load of the particular helicopter.

Cruise speed - Normal mph.

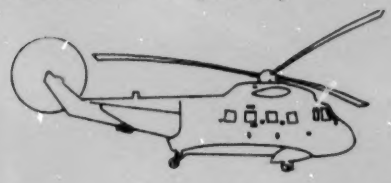
Range - Maximum range at sea level, statute miles. Never plan on using all this. Maintain reserve.

Fuel grade - Normal grade. Some helicopters can operate on others and mixtures.

Seats - Total number including crew.

Rotor diameter - For planning helipads.

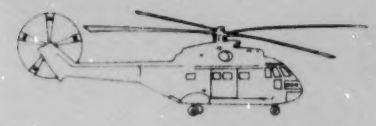
	Ceiling IGE	Useful Load	Cruise Speed	Range S.Mi.	Fuel Grade
SIKORSKY S-62 (HH52A)	12,200'	?	115	474	JP 4



Float equipped.

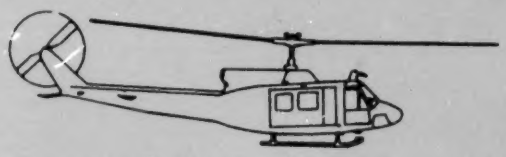
Seats 14 Rotor Dia. 53'

VOUGHT SA 330 PUMA	18,685' w 1280#		170	340	JP 4



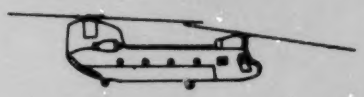
Seats 19 Rotor Dia. 49'2"

BELL 212 (Twin Huey)	17,000' w 4400#		125	320	JP 4,5



Seats 15 Rotor Dia. 48'

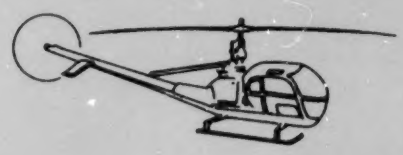
BOEING-VERTOL CH-47C CHINOOK	15,000'	several thousand	150	395	JP 4,5



Seats 33 Rotor Dia. 99' x 60'

Models A & B Chinook have less capabilities

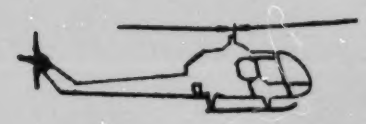
HILLER SL 3+4	15,900'	?	80	220	100/130



Seats 3-4 Rotor Dia. 35'4"

BEST COPY AVAILABLE

	Ceiling IGE	Useful Load	Cruise Speed	Range S.MI.	Fuel Grade
FAIRCHILD HILLER FH-1100	13,000' w 1335# 21,000' w 670#		120	400	UP 1-5

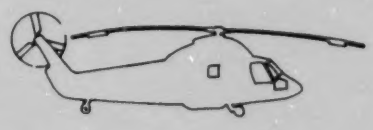


Seats 5 Rotor Dia. 35'5"

KAMANN HH-43F HUSKIE	22,000' w 1480#		110	300	JP 4

Seats 14 Rotor Dia. 47'

KAMANN UH-2C SEASPRITE	18,000' w 2561#		152	425	JP 4-5



Seats 13 Rotor Dia. 44'

ALOUETTE II	8,000' w 1660# 15,000' w 610#		112	444	JP 1-5

Seats 5 Rotor Dia. 33'5"

NOTES

BEST COPY AVAILABLE

	Ceiling IGE	Useful Load	Cruise Speed	Range S.Mi.	Fuel Grade
ALOUETTE III	10,000' w 2163# 18,000' w 1283#		118	302	JP 1,4,5

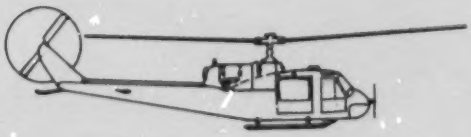
Seats 7 Rotor Dia. 36'1"

BELL 47G-3B (H-13)	16,600' w 1045# 20,000' w 495#		80	200	100/130

✪ There are many models of the 47 with very different capabilities. Check with pilot before engaging one.

Seats 3 Rotor Dia. 37'2"

BELL 204 B (UH-1, early model HUEY)	9,600' w 3900# 15,900' w 2100#		120	260	JP 4,5



✪ There are several models of the military UH-1. Check with pilot on capabilities before engaging.

Seats 10 Rotor Dia. 48'

BELL 205A (UH-1, HUEY after 1967)	7,000' w 4315# 15,000' w 1815#		120	315	JP 4,5

Seats 15 Rotor Dia. 48'

☆ Several models. Varying capabilities.

	Ceiling IGE	Useful Load	Cruise Speed	Range S.MI.	Fuel Grade
BELL 205A (UH1-D) (L-11 eng.)	4,200'	4315	120	315	JP 4,5
	11,000'	1815			

Seats 13 Rotor Dia. 48'

BELL 205B (UH1-H) (L-13 eng.)	9,000'	4315	120	315	JP 4,5
	15,000'	1815			

Seats 13 Rotor Dia. 48'

*BELL 206A JET RANGER (H-57, OH-58A)	7,600' w	1300#	134	360	JP 4,5
	10,100' w	1000#			
	12,000' w	600#			

Seats 4 Rotor Dia. 33'3"

*Recommend that no more than three (3) seats from altitudes of 4,000 FT MSL to 8,000 FT MSL. Above 8,000 FT no more than two (2) seats. (Depending on terrain to be searched and landing area for rescue.)

NOTES

HELICOPTER CAPABILITIES AND LIMITATIONS

I. Introduction:

The helicopter has proven its value in many ways throughout the world as a transportation vehicle for both personnel and cargo. Its greatest attributes are its ability to operate from highly restricted areas and remain above a selected spot.

It is however a costly tool--from about $2 per minute for small piston craft to about $8 for the medium sized turbines. This means effective management must be utilized or the cost will be prohibitive. It must buy us time or it must allow us to do a task that would be next to impossible with the available manpower.

Helicopters are as inherently safe as any aircraft yet developed. You have a far better chance of walking away from a helicopter crash than from a fixed wing crash. The accidents occur when we try to exceed the helicopter's limitations. Pilots come with varying degrees of proficiency and caution. As managers we must make decisions in many cases; thus we must have a working knowledge of helicopters and the various factors that influence their effective utilization.

The more you know about the following the better chance you will effectively utilize rotary winged aircraft.

1. Configuration of the helicopter--the number of seats, volume of internal and external cargo space, presence of cargo hook and other accessories.

2. Manufacturers performance specifications--remember these are for a Standard Day--(Sea level @ 59 degrees F).

3. Density altitude--air changes density due to altitude and temperature, therefore the ability of a helicopter to operate is a function of both these variables.

4. Wind--its velocity and whether gusty or steady.

5. Stability of the air--cause of turbulence, up and down drafts.

6. Availability of landing areas--dependent on topography and cover type.

7. Pilot's proficiency and experience.

8. Logistics--fuel, pilot flight hour limitations, remoteness of operation from supply point.

9. Availability of trained technicians for direct supervision of the helicopters--a manager is not necessarily a technician.

II. Basic Helicopter Design

1. Single rotor helicopter - The design that is most common has a single main rotor which imparts lift and thrust and a smaller tail rotor which compensates for torque induced by the main rotor.

2. Tandem rotor helicopter - This system has two main rotors. Torque compensation is achieved by having the rotors turn in opposite directions.

III. Helicopter Controls

There are four controls which are used in conjunction with each other when flying a helicopter.

1. Rudder controls or anti-torque rotor control - These pedals control the pitch of the tail rotor which compensates for torque. The amount of torque varies as power changes are made.

2. Stick or cyclic control - Directional movement and bank during turns in forward flight is induced by this control. The main rotor is tilted in the direction of stick movement causing the entire helicopter to move in that direction.

3. Collective pitch stick - This changes the angle or pitch of the main rotor blades. As pitch is increased, under certain conditions, the amount of lift is increased causing the helicopter to lift off or climb.

4. Throttle - A hand grip type throttle is mounted on the pitch stick.

IV. Helicopter Loading

It is important that a helicopter be properly loaded which means that:

1. The manufacturers recommended gross weight for prevailing conditions not be exceeded.

2. The added weight is positioned so that the helicopter center of gravity remains within prescribed limits.

3. The load is adequately secured to the helicopter. Result if exceed cyclic control--will continue in that direction.

V. Helicopter Terminology

Certain terms and conditions are closely associated with the helicopter. Being familiar with some of these is important to anyone connected with the helicopter operation.

1. Ground effect - A cushion of air beneath a hovering helicopter furnishing additional lift caused by air that is compressed beneath the helicopter. This cushion is effective to an altitude of approximately the radius of the main rotor.

2. Translational lift - Lift that is obtained when translating from a hover to forward flight. This is developed by the additional volume of air passing through the rotor system.

3. Autorotation - A non-powered flight condition with the rotor system rotating due to the relative wind caused by the descending helicopter. The rotor has inertia which is dissipated as the helicopter rate of descent is checked near the ground and landing is effected.

4. Height-Velocity curve - Each helicopter flight manual has this chart. It indicates speeds and altitudes to be maintained so that a safe autorotation may be made in the event of a malfunction.

5. Center of gravity limitations - The movement of the CG in a helicopter is restricted to certain limits. It is important, when loading a helicopter, that these limits are not exceeded as controlability of the helicopter will be affected.

6. Density altitude - Air density is affected by three factors, height above sea level, temperature, and relative humidity and they are all directly proportional. We are primarily concerned with the altitude above sea level and temperature. A high density altitude adversely affects the performance of both rotor and engine. Less lift is provided by the rotors for a given power setting and there is less oxygen available for combustion.

BASIC HELIPORT KIT (RESCUE)

WHITE RIVER DISTRICT

MOUNT RAINIER NATIONAL PARK

Rope - polypropylene 1000' x 1/4" yellow
Fire Extinguishers - 2, 18 lb. Purple K 40 B.C.
First Aid Kit - 10 man
Fluorescent vest - 6
Plastic goggles - 6
Hard hats w/chin straps - 6
Smoke grenades - 24
Fusees - 24 (30 minute)
Landing flashlights (white cone) - 2
Plastic ribbon streamers (surveyors tape) 12 rolls fluorescent orange
Panels, signal, fluorescent orange - 24 (12" x 10" each)
Message drop kits - 12
Cargo nets - 2
Bamboo wands - 25 (6' each)
Padio headband
Lead lines - 2

Kit is intended to set up heliports and helipads with items rescuers might not ordinarily have on hand. Other items can be added to meet local needs, such as barrel pump, fuel filters, chamois, fuel opening tool, special helicopter litters, traffic and crowd control signs.

EQUIPMENT

ITEM	SOURCE
Cargo net (polypropylene)	Rose Manufacturing Co. 2700 West Barberry Place Denver, Colorado 80204
Hear Guards (for crews working near turbine engines for long periods)	Mine Safety Appliances 1321 West 12th Street Los Angeles, California 90813
Helijumper protective suit	U.S. Forest Service Federal Building Missoula, Montana 59801
Helmet, helicopter pilot (USFS Spec. 5100-178)	Bell-Toptex 2850 East 29th Street Long Beach, California
Goggles, plastic	GSA or Ben Meadows Co. 553 Amsterdam Avenue N.E. Atlanta, Georgia 30306
Jakes litter	Trans-Aid Corp. 20314 South Tajauta Avenue Carson, California 90746
Safety vests	Ben Meadows Company
Stokes litter cover (MEDC drawing 356 & 313)	U.S. Forest Service Missoula
Smoke grenades & signal flares	Penguin Industries Inc. P.O. Box 97 Parkesburg, Penn. 19319

SELECTION OF LANDING ZONES

by CW_3 Ed Cleeves

1. GENERAL

The following information is furnished to assist personnel utilizing Army Aviation assets to select safe, suitable landing zones for helicopters. The primary consideration in selecting a landing zone is safety of the aircraft, passengers/crewmembers on board, personnel on the ground in or near the landing zone, and cargo.

2. TOUCHDOWN AREAS

The dimensions referred to below are of the UH-1 helicopter, however, if the same dimensions are used to select touchdown areas of landing zones for the OH-58, there will be more than enough room for OH-58 landings and take offs. The overall length of the UH-1 is just under 60 feet (57 feet, .08 inches) from the most aft position of the tail rotor to the most forward position of the main rotor. (See Fig #1). That is, when the rotor blades are turning, the UH-1 will not fit between two obstacles that are closer than 57 feet .08 inches apart. This distance will not allow any room for error in misjudging distances on the pilot's part, so add 10 feet in front and 10 feet behind the helicopter to provide a safety margin, (See Fig. #1). The width of the UH-1 main rotor is just over 48 feet (48 feet 3.2 inches); to this distance add ten feet to both sides (See Fig #2). A good rule of thumb to use in estimating these distances is to step off the distance, assuming 2.5 feet per step, then add 10% of the stepped off distance for safety. For example, 30 steps for length plus 3 for safety is 33 steps. For width, 27 steps plus 3 steps for safety is 30 steps. Therefore, if a rectangular area 30 steps by 33 steps with no obstructions (vegetation, poles, mounds, etc.) higher than 2 feet for the UH-1, (1 foot for the OH-58) is available within a landing zone, a suitable touchdown area exists, providing the slope of the ground does not exceed 8 degrees (a helicopter can not touchdown on a sloping surface that exceeds 8 degrees of slope measured from the horizontal due to design limitations). Note, however, that a touch down area within a landing zone that is only 33 steps is not large enough to permit the helicopter to takeoff or turn around in the landing zone. A touchdown area is not a landing zone. It is a part of a landing zone. (See Fig #4). Contrary to popular belief, a helicopter is not safe to take off or land vertically. Take off and landing angles must be considered when selecting a landing zone, as well as barrier height, wind direction and velocity in relation to the longest axis of the landing zone. As a rule of thumb, the approach and take off angles will not exceed 15 degrees from horizontal. This 15 degree angle must clear all obstacles by 10 feet. (See Fig #3). The higher the barriers around the landing zone, the longer the landing zone must be.

3. LANDING ZONES

Wind direction and velocity in relation to the long axis of the landing zone must be considered when selecting a landing zone. Wind speed in excess of 15 miles per hour causes turbulence as it blows across uneven terrain, around buildings and vegetation (See Fig #3). The higher the wind speed, the more severe the turbulence. This turbulence can cause a helicopter to sink when operating near the tops of obstacles, especially on the down-wind or leeward side of the obstacles. If the sink rate induced by this turbulence is great enough, the helicopter can be forced down into contact with the obstacles, resulting in a broken or badly bent helicopter and possible injury or death to the occupants and personnel on the ground near the point of impact. Select an open area with the wind blowing parallel to the long axis, or as nearly parallel as possible (See Fig #4). The long axis of the landing zone should be long enough to permit an approach angle of 15 degrees to clear the barriers by 10 feet above the barriers. The narrow axis of the landing zone should be 30 steps or more wide to allow the helicopter to hover downwind to the take off point so that the helicopter can take off into the wind and clear the barriers by a minimum of 10 feet on a 15 degree take off angle. The landing zone must be 35 to 40 paces in width at the touchdown point and at the take off point to allow enough room for the helicopter to turn around.

4. FORMATION FLIGHTS

The dimensions used are for selecting touchdown areas for a one ship landing zone. For formation flights of helicopters the landing zone must be increased in size proportionate to the number of helicopters. The more helicopters that attempt to land safely in a landing zone, the larger it must be. In regards to the long axis of a landing zone for formation flights, it should be long enough so that the approach angle of 15 degrees to the touchdown point can be made and then a takeoff made from touchdown point that will clear the barriers by 10 feet on an angle of 15 degrees.

5. MARKING LANDING ZONES

Any cut brush or debris in a landing zone should be removed as far as possible from areas where helicopters may be hovering, touching down or taking off. Loose brush and debris can be blown up into the air. If struck by a rotor blade, severe damage to the blade results. Landing zones should be marked by 2 international orange panels placed in a "T" with the top of the "T" perpendicular to the wind direction for daylight hours. At night, landing zones should be marked with 6 lights laid out in a "T" in the same manner as the panels for daylight hours. (See Fig #5). The panels must be secured to stakes driven into the ground to prevent them from blowing up into

the helicopter rotor. The lights used for night marking of landing zones must be weighted by filling the bases with rocks or sand.

Here are a few do's and don'ts that will help you to select and mark helicopter landing zones.

DO

1. Remember that a touchdown area 30 by 33 steps is only large enough for landing. It is not large enough to take off from or turn around in.
2. Attempt to find a large area that will permit a 15 degree approach angle and a 15 degree take off angle.
3. Remember that the higher the barriers, the longer the landing zone must be.
4. Attempt to find a landing zone that is oriented with the long axis generally into the wind.
5. Remember that wires are difficult for the pilot to see when approaching a landing zone.
6. Clear the touchdown area of the landing zone of all obstacles higher than 1 foot.
7. Remove all loose brush and debris from areas that helicopters may be landing in, hovering around, or taking off from.
8. Mark landing zones correctly.
9. Learn the proper hand signals to assist the pilot in landing.

DON'T

1. Leave loose brush and debris in landing zone.
2. Try to get more aircraft into a landing zone than it can safely accommodate.
3. Forget to clear the touchdown area of all obstacles higher than 1 foot.
4. Choose a landing zone that is not generally oriented with the long axis parallel to the wind direction.

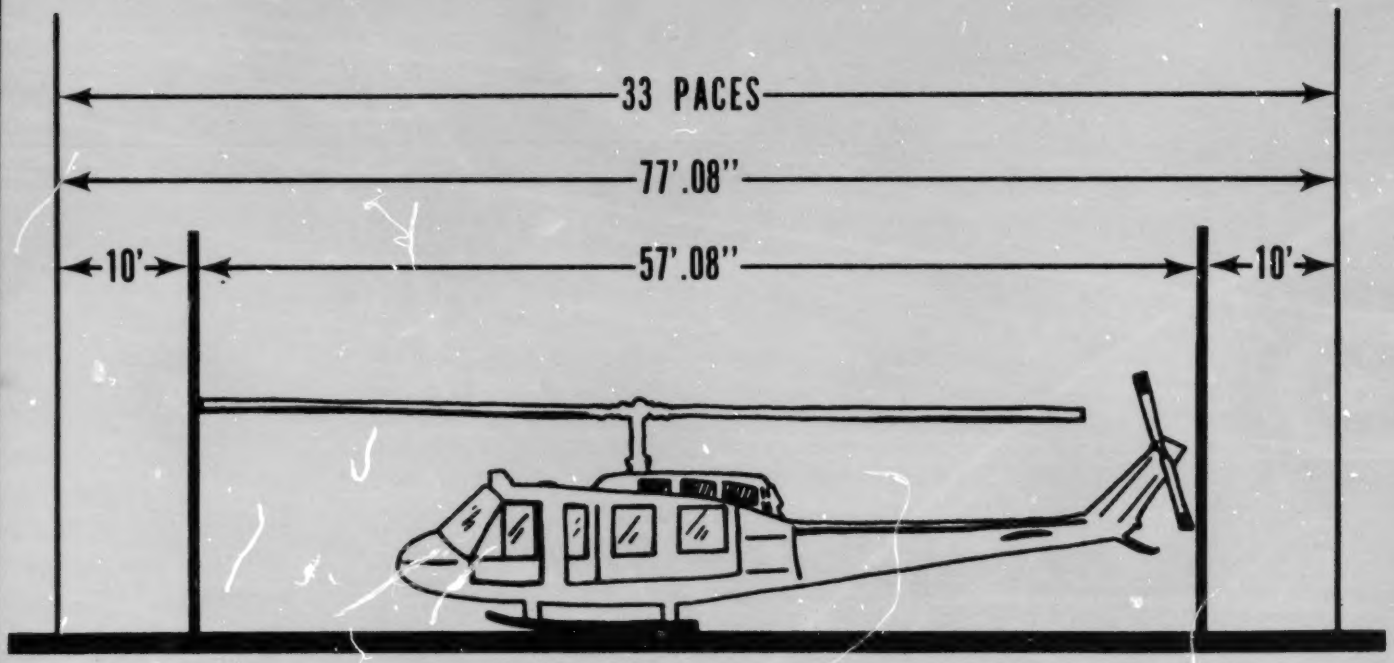


FIG #1

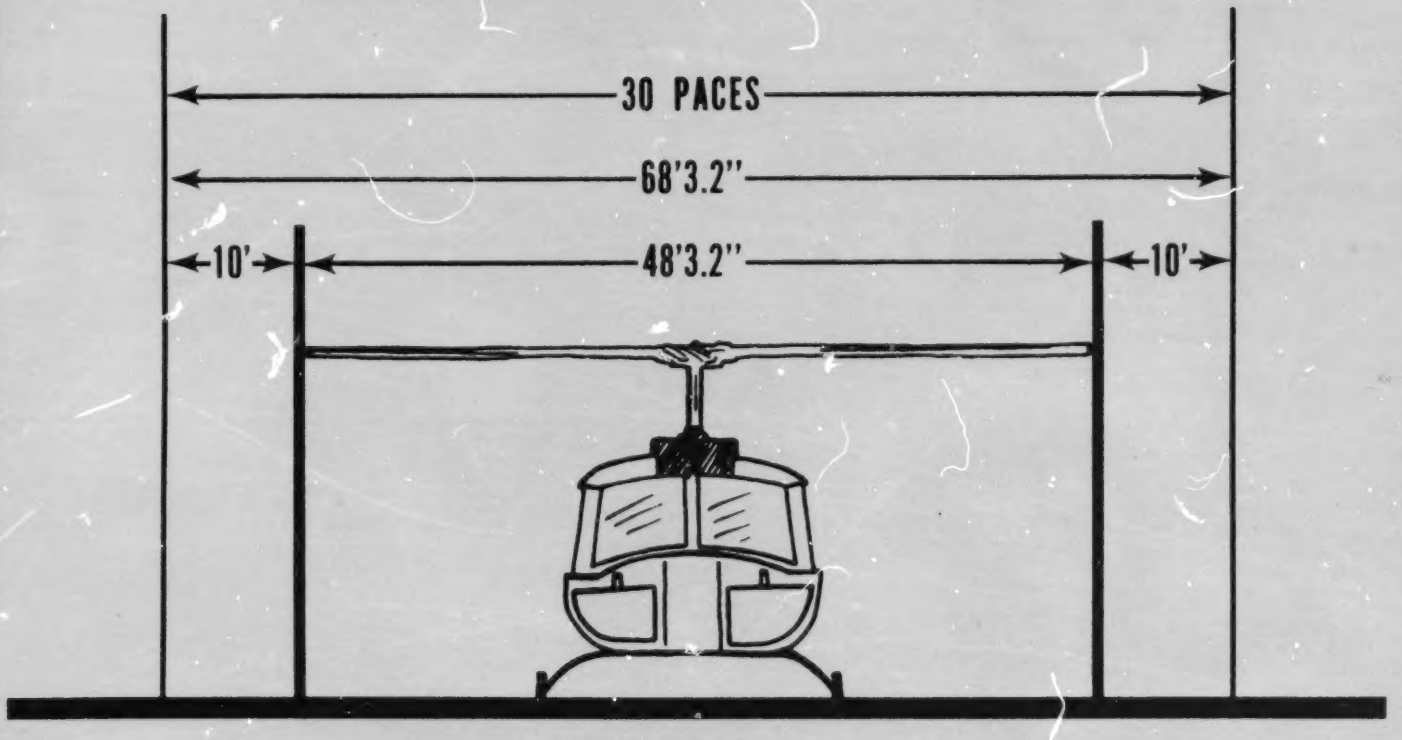


FIG #2

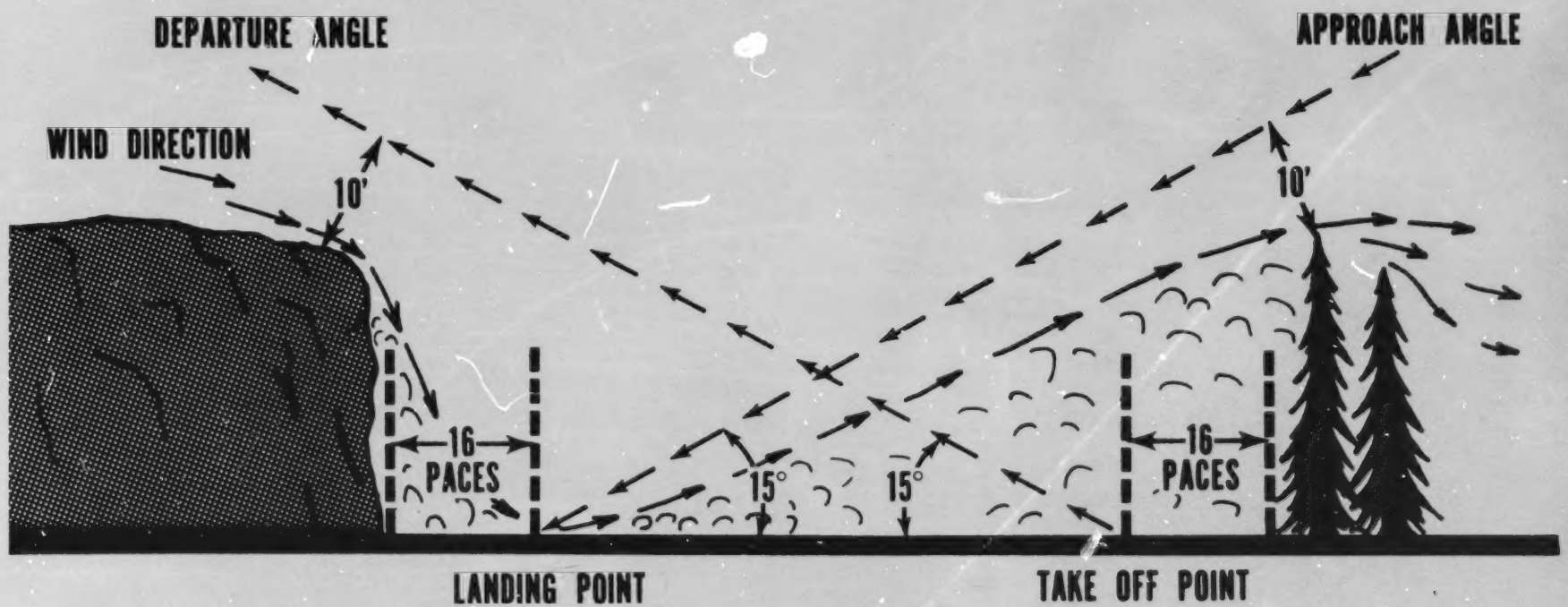

DEPARTURE ANGLE
APPROACH ANGLE
WIND DIRECTION
10'
10'
16
PACES
16
PACES
15°
15°
LANDING POINT
TAKE OFF POINT

FIG #3

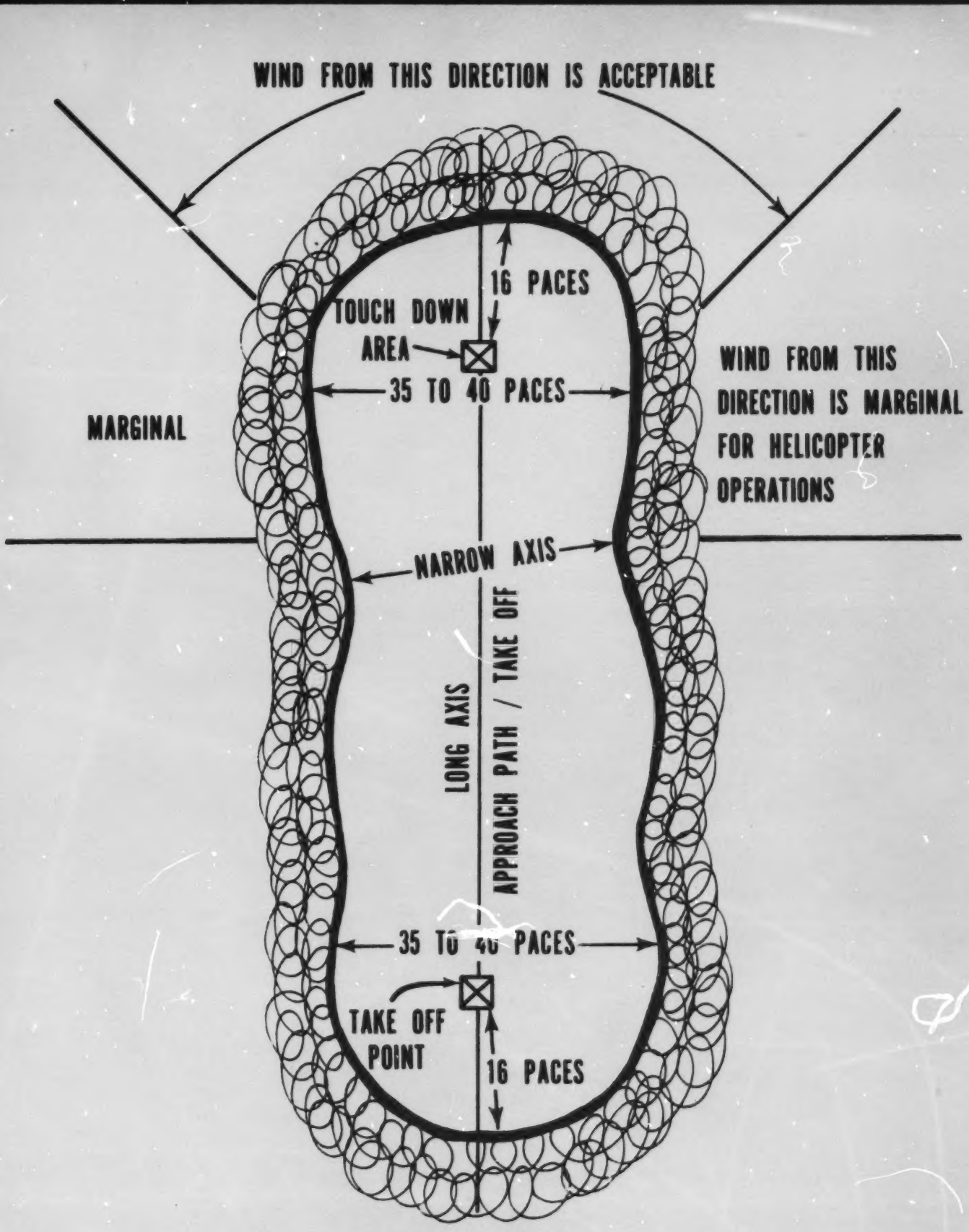

WIND FROM THIS DIRECTION IS ACCEPTABLE
16 PACES
TOUCH DOWN AREA
35 TO 40 PACES
MARGINAL
WIND FROM THIS DIRECTION IS MARGINAL FOR HELICOPTER OPERATIONS
NARROW AXIS
LONG AXIS
APPROACH PATH / TAKE OFF
35 TO 40 PACES
TAKE OFF POINT
16 PACES

FIG #4

51

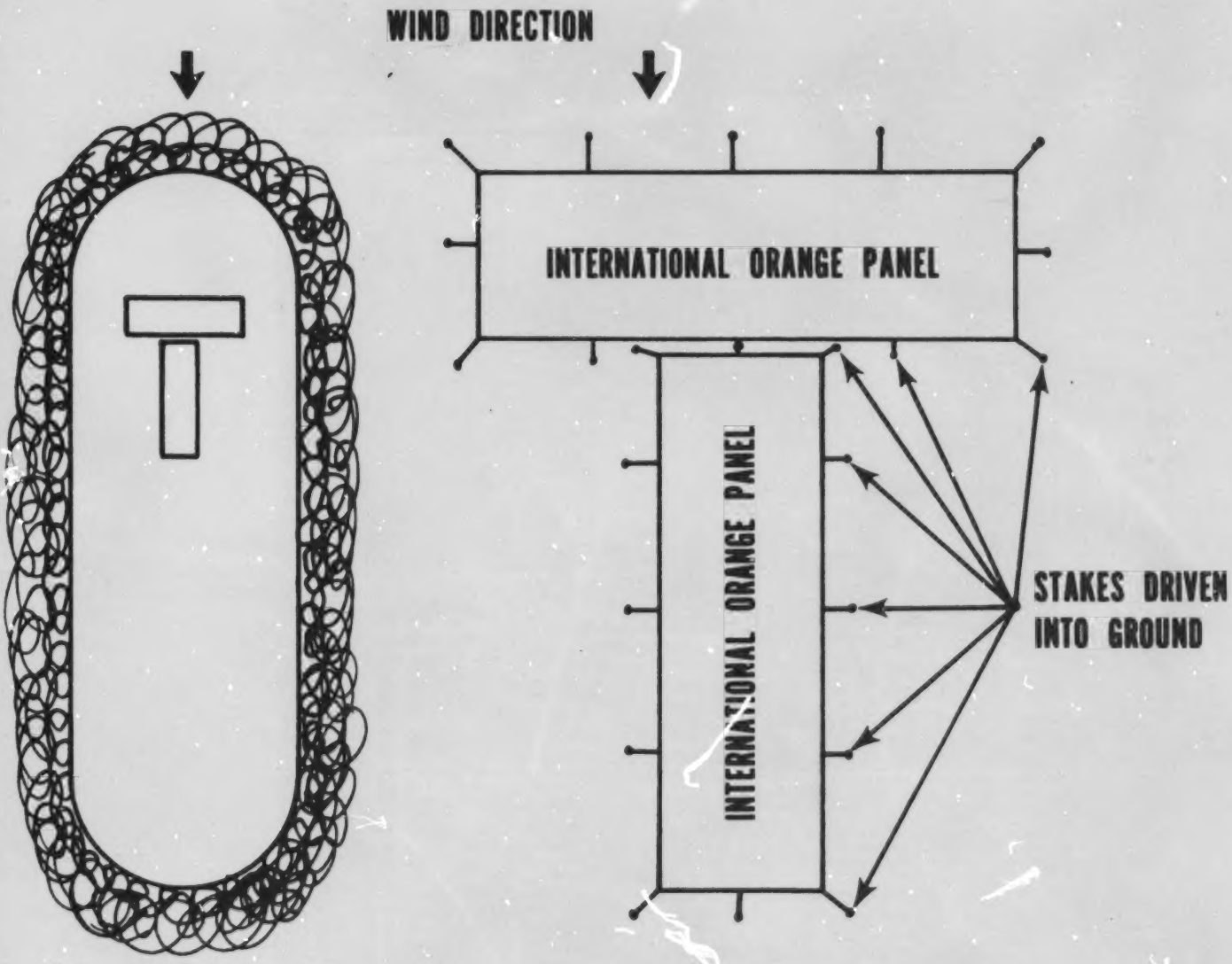

WIND DIRECTION
INTERNATIONAL ORANGE PANEL
INTERNATIONAL ORANGE PANEL
STAKES DRIVEN
INTO GROUND

FIG #5

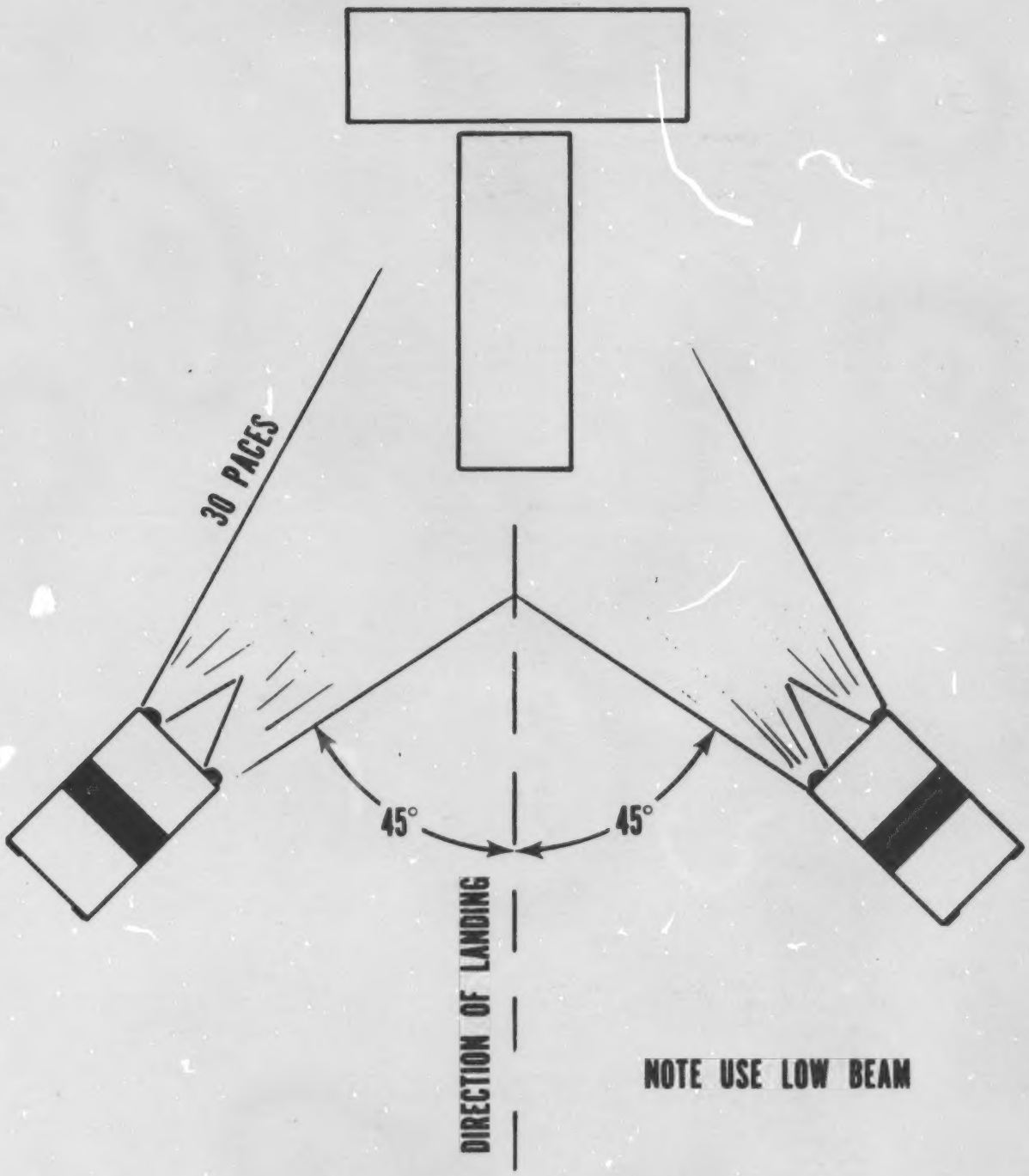


FIG #6

UNIFORM GRID MAP SYSTEM

by Ev Lasher

One of the most persistent problems of joint ground-air operations has been the lack of a uniform map system which permits quick and accurate location communication between the two. In an effort to overcome this a system has been devised by the U.S. Air Force which is being used by many agencies, including the State of Washington.

The system is based on the Sectional Aeronautical Chart and keyed to the 15' quadrangle map. Washington State and Northern Oregon are covered by the Seattle Chart. This chart should be numbered in the following manner: Grid number one is located at 125 degrees west and 49 degrees north which is the upper left-hand corner of the map. Number each 15' quadrangle in sequence from west to east with number 32 reaching just into Idaho at 117 degrees west and 49 degrees north. Return to 125 degrees west at 48 degrees 45' with number 33, then west to east again in sequence and repeat until the map numbering is completed at 117 degrees west and 44 degrees 30' north. The last number is 576.

Each 15' quadrangle should be labeled with the proper grid number. This is most important.

The 15' and 7-1/2' quadrangles should be prepared and translated as follows:

1. Quarter the 15' quad into 7-1/2' quads A,B,C and D as shown below.

2. Beginning at each neutral (free) corner, draw vertical and horizontal lines on a one-mile scale from those respective corners. Place mileage numbers as indicated.

   a. On A begin at upper left-hand corner.
   b. On B begin at upper right-hand corner.
   c. On C begin at lower left-hand corner.
   d. On D begin at lower right-hand corner.

3. On 7-1/2' quadrangles draw one-mile scale lines from respective and proper corners as indicated in 2--a,b,c and d.

4. Label each 7-1/2' quad with proper grid number, plus appropriate letter: SEA XXX X

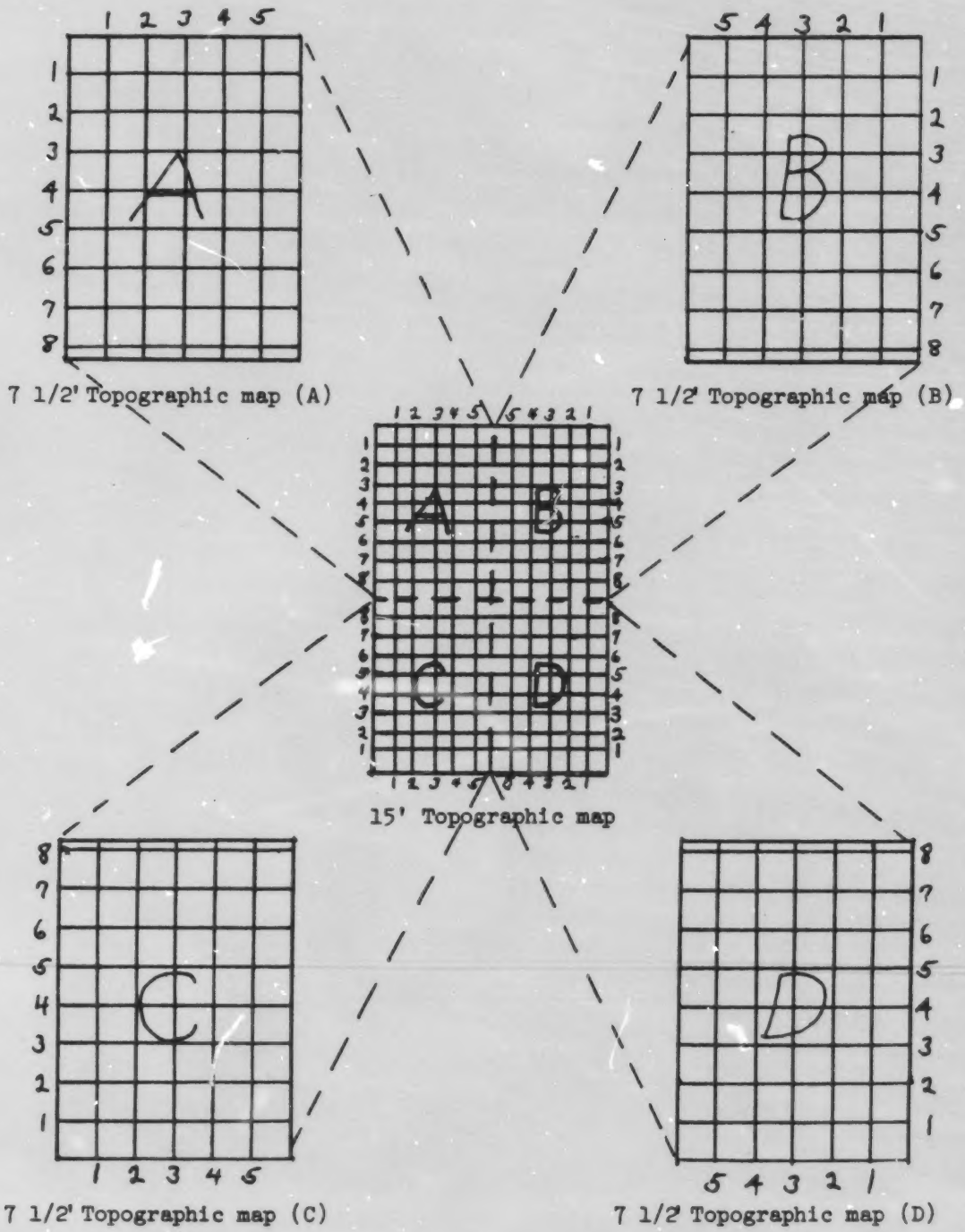
5. To read maps count (measure) horizontally from appropriate map edge whole miles plus appropriate tenths; then count (measure) vertically whole miles plus appropriate tenths.

6. To translate map relate SEA (for Seattle), XXX (appropriate grid number) X (letter a,b,c or d) XX (horizontal miles and tenths) and XX (vertical miles and tenths). This will enable the recipient of the information to get within a tenth of a mile of the caller.

7. There is no substitute for knowing exactly where you are. The information received will be no better than the information sent.

8. These same concepts can be used on any map if properly labeled and laid out beforehand. Your local Director of Emergency Services can provide details.

15' TOPOGRAPHICAL MAP KEY



7 1/2' Topographic map (A)

7 1/2' Topographic map (B)

15' Topographic map

7 1/2' Topographic map (C)

7 1/2' Topographic map (D)

AIR TRANSPORTATION AGREEMENT AND MANIFEST

DATE	PLACE

FULL NAME OR ORGANIZATION

PERMANENT ADDRESS

For and in consideration of being permitted to fly as a passenger in an aircraft operated by or on behalf of the United States of America, for and on behalf of myself, my personal representatives, heirs and assigns, I, by signing hereunder, release and discharge the United States, its agents, servants, or employees from any and all claims for property damage and/or personal injury or death resulting from or during said flight or flights or continuances thereof or from ground operations incident thereto.

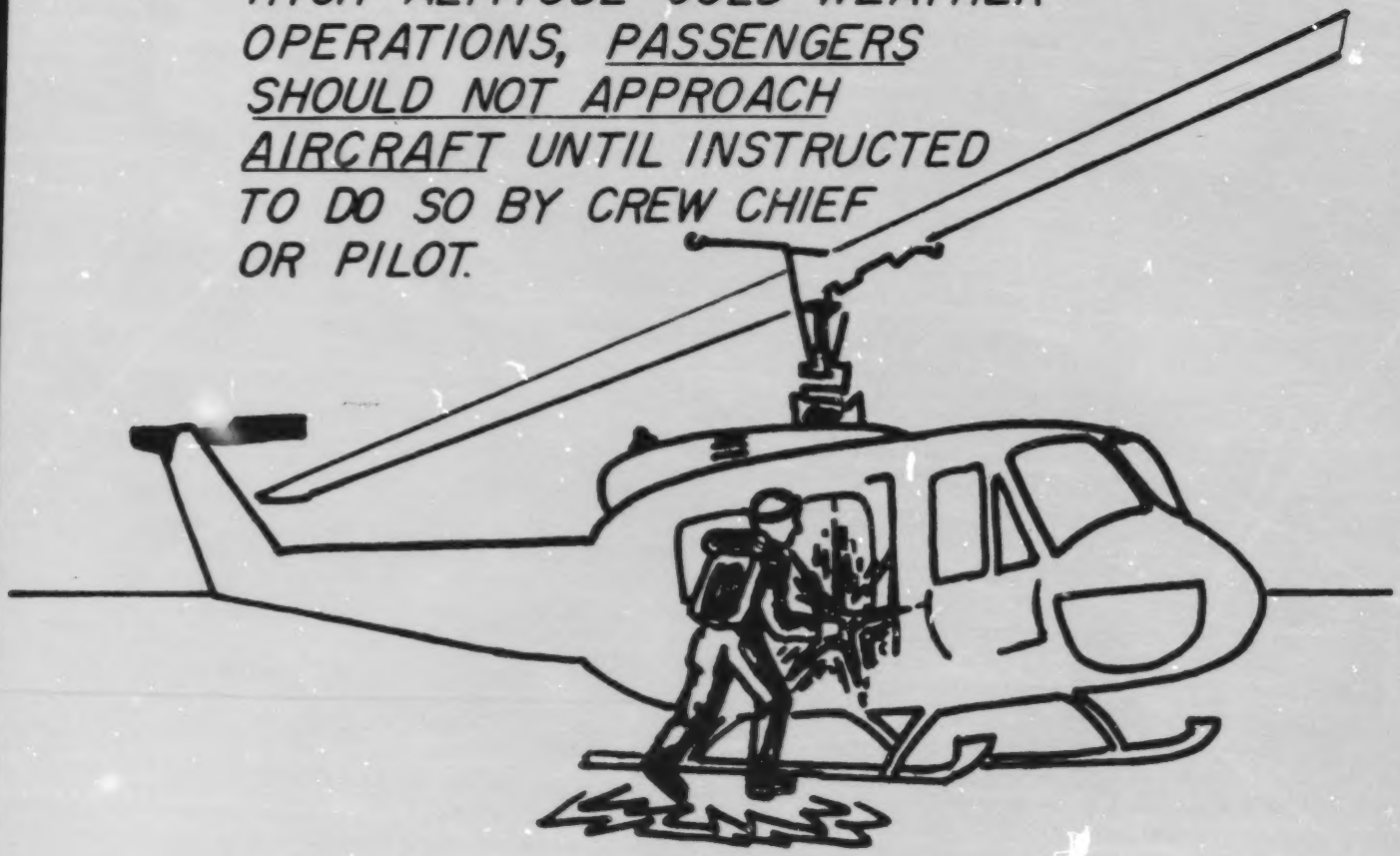
SIGNATURE	DES. NO.	SIGNATURE	DES. NO.
1.		15.	
2.		16.	
3.		17.	
4.		18.	
5.		19.	
6.		20.	
7.		21.	
8.		22.	
9.		23.	
10.		24.	
11.		25.	
12.		26.	
13.		27.	
14.		28.	

WITNESS | WITNESS

Name and address of person to be notified in Emergency

WARNING

DUE TO THE DANGER OF HIGH VOLTAGE CREATED BY STATIC ELECTRICITY, ESPECIALLY AT HIGH ALTITUDE COLD WEATHER OPERATIONS, PASSENGERS SHOULD NOT APPROACH AIRCRAFT UNTIL INSTRUCTED TO DO SO BY CREW CHIEF OR PILOT.



GUIDELINES FOR MILITARY AIRCRAFT RESCUE

by Gene Fear

Rational

Since volunteer and untrained personal will probably be the first people on the scene of a military aircraft accident an awareness of the potential dangers involved is essential. This information should be known by all primary SAR response agencies and dispensed to the reporting persons as a warning to prevent further loss of life.

****** WARNING ******

Any military fighter or bomber type aircraft must be considered dangerous to any persons near the scene.

Do not lose your life attempting to rescue someone amid wreckage that is so bad it was impossible to survive.

STOP — THINK — OBSERVE — PLAN — BEFORE NEARING THE AIRCRAFT

- After reporting the crash, qualified military people are on the way to help. So secure the area for them.

Consider

- The aircraft could be loaded with all sorts of explosives.
- If the aircraft is scattered the explosives are all around you.
- Carry a CO_2 extinguisher for your escape route.
- CAUTIOUSLY approach aircraft from the left side.
- Step carefully - Do not touch or move anything except to save a life.
- Look up for parachutes and all around for survivors who have been thrown clear or have crawled away from the crash.
- Use care explosive fuel is all around you. No smoking or sparks. No vehicles closer than 500 feet. Prevent fire from starting.
- Move cautiously. Never get in front of the guns or rockets.
- Look at cockpit area. If the canopy is missing and the pilot is still in the seat. (BEWARE) He has armed the ejection seat to rocket him 300 feet into the air. Any jar could set them off.
- Most likely he did not survive the 200 mile per hour landing. So back off. Do not risk your life.

BEST COMMON SENSE RESPONSE

STEP onto the wing very gently. LOOK into the cockpit. Does the pilot look alive? Breathing, or moving at all? LOOK for all the BLACK and YELLOW handles and rings. Have they been moved out of their normal positions? If they have leave rapidly. Don't risk your life for a dead person.

Remember: If the aircraft crashed 20 minutes ago and the pilot still has on his oxygen mask, with the canopy still on, chances are he died from lack of oxygen when the aircraft life support systems stopped.

○○○○○ USE CAUTION - NO NEED TO HURRY
THIS IS A DANGEROUS PLACE TO BE ○○○○○

The military has trained people to evacuate the pilot. They are on the way. KEEP ALL PERSONS BACK -
- SECURE THE AREA FOR THEM -

EMERGENCY RESPONSE TO A CRASH
THAT HAS JUST HAPPENED IN YOUR YARD

- Have someone call the nearest military base and report the crash. Ask the base operator to connect you to the DISASTER CONTROL OFFICER and specify you are reporting an aircraft crash. Have type of plane, plane's number and the exact location.

IMMEDIATE ACTIONS FOR RESCUE

- READ RESCUE INSTRUCTIONS ON LEFT SIDE OF AIRCRAFT (PAINTED IN LARGE ORANGE & YELLOW LETTERS)
- FOLLOW INSTRUCTIONS explicitly - Your life will be at stake.

1. Blow off the canopy only if there is fire. (This arms the seat).
2. Unlatch the canopy and hand raise it carefully or cut the plexi glass with a heavy axe.
3. Unsnap the oxygen mask. THEN INSERT SAFETY PINS in the seat arms or on top of the head rest. (The safety pins are in the cockpit in a bag or container).
4. Move slowly and cautiously with those safety pins or you could rocket 300 feet into the air.
5. Put your finger tips on the pilots jugular vein..... and check for life.

NOW STOP EVERYTHING AND EVALUATE YOUR SITUATION

-----You are standing on a bomb, about to explode.
-----The pilot or observer is strapped to an explosive seat. He may have ARMED IT.
-----The plane itself is loaded with very volitile fuels, hydrolic fluids, oxygen and many switches that can cause sparks to ignite them.
-----Any movement could cause loose wires to spark causing a flash fire.
-----No smoking or fire lighting of any kind. Your life is at stake.
-----Any miss handling of those seat rests or black and yellow striped handles can cause the seat to eject with your head and arms.
-----Keep, everyone that is not helping you 1000 feet away because of bomb and explosives. (If you see bombs aboard, evacuate all people one-half mile away - NOW!!!).

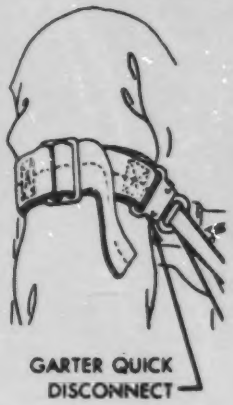
NOW RE-READ THOSE INSTRUCTIONS painted in ORANGE & YELLOW letters. You must deactivate the ejection seat and disconnect the battery (left front) before doing anything else. Read and find out how to do it.

1. DISCONNECT BATTERY
2. INSTALL THE SAFETY PINS OR SOMETHING TO KEEP THE ROCKETS FROM FIRING (NAIL OR SMALL ROD)
3. RELEASE LEG RESTRAINTS AT THEIR QUICK RELEASE CATCHES
4. MOVE SLOWLY AND CAREFULLY - Your next task is dangerous to your life.
5. STRADDLE THE COCKPIT ABOVE THE PILOT (necessary to lift 200 pounds)
6. LIFT HIM BY THE CHUTE HARNESS VERY CAREFULLY so as not to catch on the seat arm rests or rings. Beware of switches and loose wires or anything that might trigger those powerful rockets.

☆ Remove the victim and all personnel 1000 feet away.

☆ Secure the area for the disaster control team that is on the way.

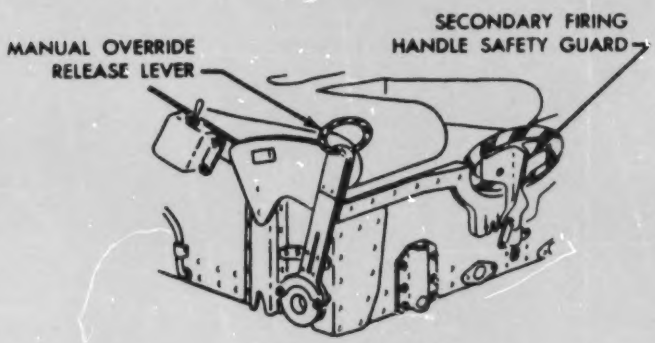
RELEASE CATCHES



EJECTION SEAT SAFETY AND PILOT OBSERVER REMOVAL

Use common sense and good judgment if there is no fire, and if there appears to be little chance of one. It is advisable to leave the injured in their seats until qualified medical personnel arrive. To remove the pilot or observer, perform the following steps.

1. Install safety pin in ejection gun sear. If safety pin is not available a metal pin the diameter of a TEN-PENNY nail will safety the ejection gun sear.



RIGHT SIDE OF SEAT

2. Move manual override release lever OUTBOARD and AFT to release leg restraint cords.

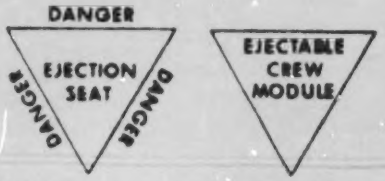
3. Unlock harness quick disconnect fittings by squeezing release bar tabs and at same time moving release bar upward. (Harness quick disconnect fittings are located near pilots shoulders.)

5. Tilt pilot or observer forward from waist and turn shoulders toward cockpit access door opening. Grasp pilot or observer under arm-pits, lift and pull through access door opening or emergency canopy opening.

NOTE: Leg garters can be released from the leg restraint cords at the quick disconnect by squeezing serrated lock release tabs to free lock ring.

4. Unlock lap belt and remove survival kit vertical restraint straps.

NOTE: If the harness quick disconnect fittings and the lap belt cannot be unlocked, or if the survival kit vertical restraint straps cannot be removed, the pilot or observer can be removed with parachute and life raft attached.



MARKINGS FOR RESCUE
Painted ORANGE/YELLOW

EXIT

CHOPPING LOCATION

DO NOT TOUCH ANY SWITCHES PAINTED RED OR WITH RED COVER GUARDS OTHER THAN STORES SELECTOR POWER AND PHOTO CONTROL SALVO AND POWER. SERIOUS PERSONNEL INJURY COULD RESULT

BEST COPY AVAILABLE

FT RUCKER 054239

(Extracted from "Emergency Actions at the Scene of Military Aircraft Accidents)

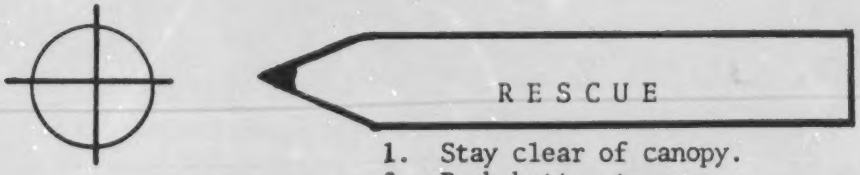
Prepared for Use of Civil Authorities by
Disaster Control Officer, 92d Strategic Aerospace Wing
Fairchild Air Force Base, Washington
United States Air Force

RESCUE PROCEDURES

1. APPROACHING THE AIRCRAFT. Approach the aircraft with the wind at your back. This is particularly important if the aircraft is burning and, even if not, it could ignite at any moment. If the area of the crash is overgrown with high grass or bush, avoid approaching in a vehicle on the same path the aircraft took after striking the ground. It is possible survivors may have been thrown out of the aircraft along the path. DO NOT SMOKE OR IGNITE MATCHES AND, if available, carry CO_2 or dry chemical fire extinguishers for emergency use.

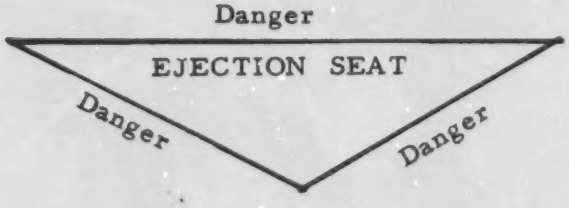
2. LOCATION OF ESCAPE HATCHES, DOORS AND EXITS FROM AIRCRAFT. The location of emergency entry points, escape hatches, doors and exits are indicated by orange-yellow markings on the outside of the aircraft. On jets, arrows will indicate the rescue points. Instructions are stenciled by the arrow for the jettison of canopies or hatches. Use care in jettisoning these devices, as they are ejected violently with force. DO NOT RAISE, MOVE OR TAMPER WITH ARM RESTS OF CREW MEMBERS SEATS as the arm rests activate the ejection seat and are extremely dangerous. (Depending upon the aircraft, the seat ejects upward or downward.) When removing injured persons from their seats, first remove their parachutes or, if that is not possible, use caution to insure that the parachute harness does not catch on and move the arm rests.

   a. Below is an example of an emergency entry marking which will be painted in orange-yellow:



1. Stay clear of canopy.
2. Push button to open.
3. Pull "T" handle out 6 feet to jettison canopy.

   b. Below is an example of markings on an aircraft equipped with ejection seats:



3. HANDLING OF INJURED PERSONNEL. Injured personnel should be carefully and quickly removed from the aircraft upwind to a distance of 2000 feet to preclude further injury from fire or explosion. Administer first-aid as required. Search the entire area around the aircraft for survivors who may have been thrown clear as they may be wandering around in a dazed condition.

4. DANGEROUS CONDITIONS WHICH MAY EXIST. Aircraft normally have large quantities of high test gasoline or jet fuel on board. If the aircraft is not on fire, be alert for fuel fumes and do not permit smoking anywhere in the immediate area. Be on constant alert for the possibility that the aircraft could burst into flames momentarily. Initially, consider that the aircraft may be carrying ammunition, high explosives or nuclear weapons. Therefore, if the plane is on fire, these items plus the fuel and oxygen tanks could explode. As soon as rescue operations have been completed, clear the area for at least 2000 feet around the aircraft. The danger of a nuclear explosion or radiation from a nuclear weapon exposed to fire is negligible. It is virtually impossible to inhale a dangerous internal dose of radioactive materials from exposure to a burning nuclear weapon. Nuclear weapons do, however, contain high explosives which may detonate when exposed to fire. Such an explosion WILL NOT cause a nuclear blast. The Air Force will provide a team of specialists who will check persons who may have inhaled smoke and inspect the entire area for contamination.

FIREFIGHTING PROCEDURES

1. DANGER.
   a. The usual aircraft crash fire involves high test gasoline, jet fuel, oil and broken metal surfaces. Combustion is sudden, flash backs are common and dangerous, and explosions are a constant hazard. Structural fires confined within buildings are progressive in nature and have greater smoke hazard. These differences call for different methods of approach, removal of hazards and extinguishment. Always assume that the aircraft is carrying live ammunition, rockets, missiles, nuclear weapons and fuel. Nuclear weapons present no greater danger than high explosives, except for a very minor chemical or radiation hazard. Firefighters should wear masks if available. Most nuclear weapons have high explosives that are expected to burn and not detonate; however, maximum effort should be directed to keeping weapons cooled with water fog. Conventional bombs may explode when exposed to fire or intense heat and should be kept cool with water fog. Under no circumstances should high explosive material from ruptured weapons or components be handled, stepped on or disturbed in any manner. This material is extremely sensitive to detonation from shock or impact.

2. PROCEDURES.

a. Use extreme caution when approaching a crash for injured personnel or bodies of victims that may have crawled or have been thrown from the wreckage so equipment will not run over them. Approach with wind, if possible, and spot equipment on the upgrade/wind side. Many times the only agent you will have to fight a crash fire will be the supply in your equipment. Conserve your agent. Do not use it unnecessarily. Use your agent only in the rescue area. After rescue has been accomplished, then use your agent to extinguish the fire. The objective is to control and rescue. Of course, a serious exposure may require the use of agent in another area. A high pressure fog, broken very fine with a driving force, makes a good fire control stream. If possible, direct a stream immediately on the area where personnel are. If it has been determined bombs are present, it is recommended all personnel withdraw a minimum of 2000 feet upwind, if possible, and take cover. Personnel not needed in the area should be encouraged to leave immediately including any residents within one mile of the area.

b. Cutting through an unmarked area may release additional fuel such as gasoline, oxygen, etc. Cut down both sides across bottom where marked for rescue and raise like a door. A good heavy fire ax will generally do the job. Use caution when cutting through, personnel may be close by inside and may be injured with your ax.

c. Working around a crashed aircraft can be very dangerous. All sources of ignition should be eliminated. Fires have been known to start several hours after the impact. Have fire protection, if possible, when working in a gasoline or jet fuel spill area to avoid being caught by a sudden flash of fire. Approach a jet plane at an angle to avoid being directly in front or rear of the aircraft. There is always the danger of explosions caused by fuel tanks, oxygen tanks, ammunition and ejection seats.

d. At a large plane crash, there are chances that you cannot do much with small firefighting equipment, but there is always a chance of personnel being thrown clear of burning areas; also, of personnel attempting to bail out at too low altitude. Search the area for these personnel.

f. Anyone arriving at a plane crash ahead of the firefighting equipment can do considerable service by sending someone back to meet the equipment and directing them in. This is especially effective at night.

FURTHER INFORMATION: Should your agency desire further information regarding firefighting or rescue techniques, the Chief of the Fire Department, Fairchild Air Force Base, Washington is available to help you.

AREA CONTROL AND SECURITY

1. GENERAL. Both military and civil police are well trained in emergency measures required for such disasters as floods, tornadoes, etc., however, because of the infrequency of aircraft accidents, the need for securing exposed classified material/information, safety hazards to personnel resulting from explosives, fire, etc., and the need to keep the crash area from being disturbed to an extent that would hinder the investigation to determine the crash causative factors. These type of disasters require emergency operations which are, in a sense, unique to the military. Guidance contained herein is intended to assist civil authorities at the scene of such disasters.

   a. It is obvious that in an accident in which there is a weapon that contains nuclear materials and there is a detonation of the high explosive element, there will certainly be a scattering of radioactive material. In a condition such as this, there is some danger. Yet, the biggest danger is not in the accident itself or in the scattered radioactive material, but in the public apprehension and fear and the inevitable scare-type rumor. You might reasonably ask what then is the extent of the real known danger. In an aircraft accident with a weapon of this type, the most danger is in the explosion and burning of the fuel and the non-nuclear high explosion of the weapon on board. This can cause flying debris and fire. This danger exists in all aircraft accidents.

   b. Sufficient aerospace security force personnel (qualified USAF Air Policemen) from the nearest Air Force installation will be dispatched to the scene of a military aircraft accident immediately upon notification. However, because of the travel time involved in responding to an off-base disaster, it is most probably that civilian police will arrive at the scene well in advance of any military personnel.

2. NOTIFICATION AND INITIAL ACTIONS. In all probability, civil authorities will be initially notified of an off-base aircraft accident by local residents or witnesses. In any event, further official notification and a request for assistance will be made by either the USAF Air Police or other official source.

   a. Securing the Scene:

      (1) Because of the danger of flying debris, heat and other high explosive effects, an area boundary should be established to a distance of 2000 feet from the crash scene. Only those essential personnel such as fire-fighters, doctors and those directly associated with controlling the disaster should be permitted within this cordon. Others within this area should be evacuated immediately.

      (2) To afford effective vehicular and entrance control, a single entry point into this area is imperative to provide essential and effective control. This location also serves as the command post or on-the-scene headquarters for emergency forces at the scene. In selecting this position, a point should be selected which affords the best observation of the scene. In addition, the control point must be located upwind from the scene. This places controlling personnel in a safer position

in the event tiny radioactive particles are blown by the wind.

(3) You will be informed if classified material/information is involved. If it is, the importance of keeping out curiosity seekers and unauthorized personnel becomes even more important. Any efforts on your part to cover such items or otherwise shield them from public view will insure their security pending the arrival, their names should be recorded and released to the military authorities upon their arrival. USAF representatives will assume the task of receiving and properly securing such items upon their arrival at the scene.

3. IDENTIFICATION OF AUTHORIZED PERSONNEL

a. Military representative: Authorized military representatives may be identified by the following means:

(1) The standard USAF Identification Card (DD Form 2AF).

(2) Security force personnel display the USAF Air Police Shield and police equipment.

(3) Firefighting personnel are readily identifiable by their special clothing and equipment.

b. Civilian emergency personnel such as rescue, police and medical personnel may be admitted upon recognition (badge, identification or personal recognition).

c. Personnel recognized by any of the above means may vouch others into the area.

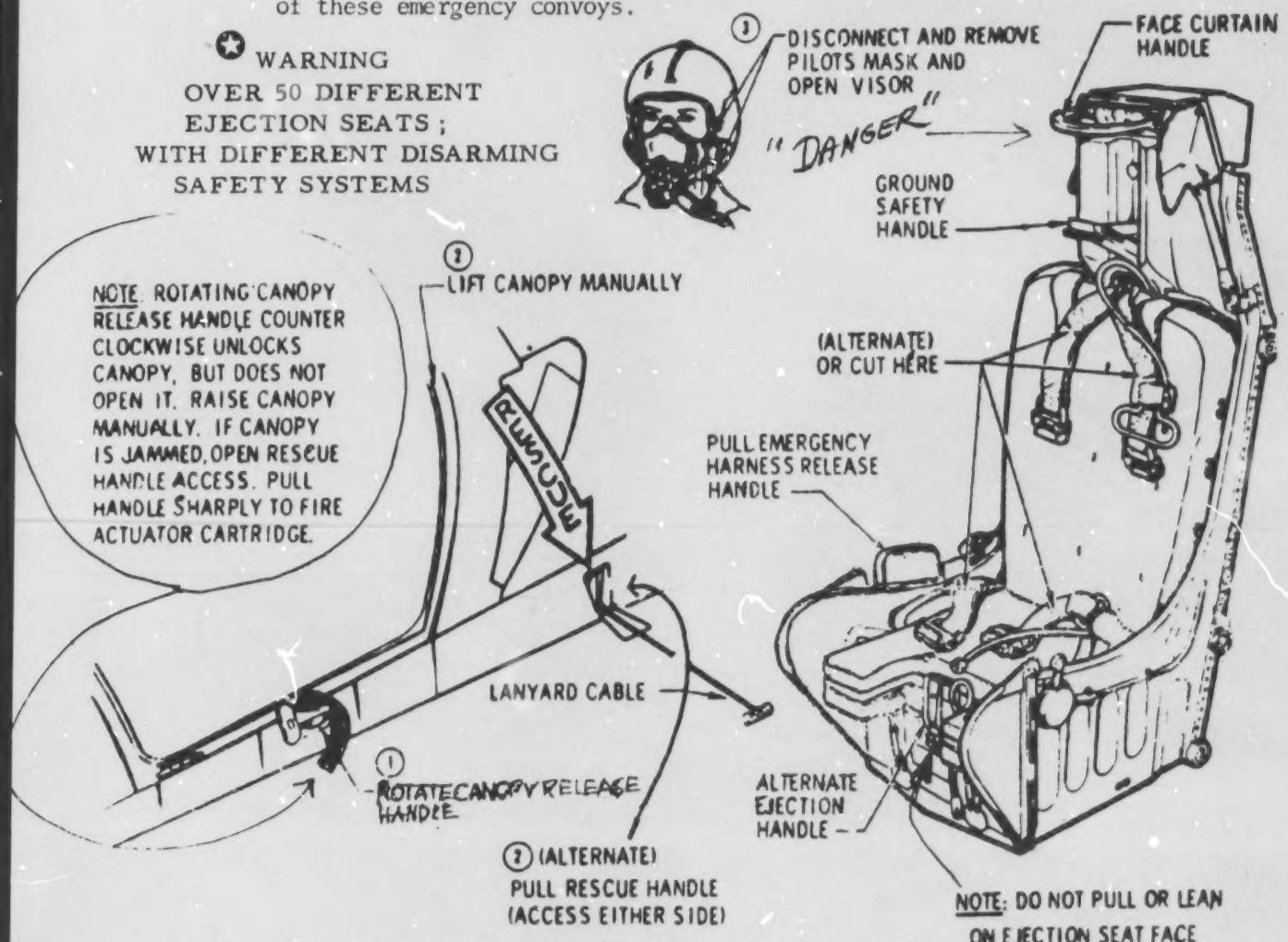
d. Our current disaster plans call for the immediate dispatch of Air Policemen to an off-base accident. Therefore, in all probability, identification procedures for military personnel will not be a particular problem for civil authorities. After arrival of this initially dispatched security force, the noncommissioned officer in charge of this detail will provide authentication of military persons to be admitted.

4. SPECIAL ASSISTANCE.

a. The location of parts of the aircraft are important in determining the cause of the accident. Unless the wreckage presents a hazard to life or property, it should not be moved.

b. Because of the unique jurisdictional aspects of an off-base accident, USAF security personnel may request your assistance in dealing with reluctant curiosity seekers and newsmen. Specific instructions on the release of information to newsmen is contained in Section VI of this brochure; however, because of the security implications, a few basic requirements are pertinent to police authorities and are mentioned here. The Director of Information represents the USAF in all matters pertaining to news releases. He or his representative will normally be at the scene. In his absence, the senior military representative present will fulfill this responsibility. Security force personnel have specific instructions which prohibit them from using force to preclude photography or sketching by authorized newsmen. These personnel are merely requested by the sentry not to photograph or sketch unless cleared by the Director of Information. In the event these press representatives persist, your assistance will be requested pending the arrival of agents of the Federal Bureau of Investigation. As you know, it is a federal offense to unlawfully photograph or sketch items deemed essential to national security.

c. Follow-up support will be dispatched from this installation to the scene as needed. Air Police officials will coordinate the movement of these emergency convoys.


WARNING
OVER 50 DIFFERENT EJECTION SEATS; WITH DIFFERENT DISARMING SAFETY SYSTEMS
1 DISCONNECT AND REMOVE PILOTS MASK AND OPEN VISOR
"DANGER"
FACE CURTAIN HANDLE
GROUND SAFETY HANDLE
(ALTERNATE) OR CUT HERE
PULL EMERGENCY HARNESS RELEASE HANDLE
ALTERNATE EJECTION HANDLE
NOTE: DO NOT PULL OR LEAN ON EJECTION SEAT FACE CURTAIN HANDLE OR ALTERNATE EJECTION HANDLE
2 LIFT CANOPY MANUALLY
NOTE: ROTATING CANOPY RELEASE HANDLE COUNTER CLOCKWISE UNLOCKS CANOPY, BUT DOES NOT OPEN IT. RAISE CANOPY MANUALLY. IF CANOPY IS JAMMED, OPEN RESCUE HANDLE ACCESS. PULL HANDLE SHARPLY TO FIRE ACTUATOR CARTRIDGE.
LANYARD CABLE
1 ROTATE CANOPY RELEASE HANDLE
2 (ALTERNATE) PULL RESCUE HANDLE (ACCESS EITHER SIDE)

BEST COPY AVAILABLE

A GUIDE TO THE USE OF AIRCRAFT IN SUPPORT OF LAND SAR OPERATIONS

Adapted by Major Forest Kimsey, USAF
Lt. Cdr. Ron Addison, USCG
Lois Clark McCoy
and John Dalle-Molle, National Park Service

Revised for NASAR by the Aviation Committee

OVERVIEW

It is imperative that any successful SAR effort begin with an established line of communication between the forces involved and one central "command post" which must be established.

Even though we are directing our attention to one particular area of the entire picture, keep in mind that all coordination between the air and surface searchers still must be funnelled through a common source and each resource is dependent on the other.

GENERAL

What Aircraft can do:

Fixed Wing Aircraft
Amphibian
Helicopter
STOL

Aircraft can get on-scene first. This is important for initial route search, initial surveillance, terrain check, etc. From this early information the Ops leader can obtain overview of the entire area, establish intelligence, reconnaissance, and searching, or drop in messages, supplies or pararescuers. Fixed wing aircraft and helicopters can do the above; in addition helicopters are even more versatile in that they can move men and supplies to definite search areas, pick up victims and sometimes search more effectively than fixed wing because they can work at slower speed and lower weather.

What aircraft cannot do: Because of non-availability of the proper type of aircraft, bad weather conditions, non-qualified pilots, mechanical difficulties, limited fuel supplies or maintenance problems, the best planned air SAR can run into difficulties. Augmentation of aircraft should be considered in conducting any proper SAR ground operation. Never rely completely on any one method of search to carry out the air or ground SAR operation.

In some searches, nothing can take the place of ground teams for thoroughness, providing manpower is adequate for size of search area and terrain permits search by ground. In other cases aircraft may be the only hope for a live recovery, depending upon the search objective, area of search, time lost, terrain, etc.

1. MANAGEMENT

1.1 THE SAR PLAN

A. Authority/responsibility: Establish which agency has control over which area.

B. Cooperative agreements: Develop supportive agreements between volunteers, military, CAP, sheriff, USFS, and other participating agencies.

C. Coordination between agencies: Determine who does what, federal, state, local.

1. Air support request procedures: Establish who makes request, what channels must you go through - make request directly to pilot or owner, through sheriff, state emergency coordinator, USFS district ranger, etc? What are the special SOPs for requesting military aircraft?

2. Ground Operations Plan: Develop a ground operations plan in case aircraft are not available due to weather or some other reason. Don't create a "bottle neck" by waiting on some aspect of the air SAR. There is always something to do.

1.2 AIRCRAFT CAPABILITIES AND LIMITATIONS

A. Aircraft - Various types and models: which have capabilities to work effectively in your area? Temperature, altitude - consider federal, state, local and private sources.

Availability of proper aircraft in your area: High wing, low wing, STOL characteristics, number of persons carried, mission capabilities, etc.

Inventory of same with periodic update: Update phone lists to obtain these aircraft.

Cost factors: who will pay for private aircraft; are free military ones readily available, capable?

B. Control - Get to know owners, commanders - establish good working relations, mutual confidence. Set up practice training.

Get right pilot, fly right search area.

C. Pilots - Experience, training, restrictions (i.e., amount of mountain or unusual terrain experience), attitude (i.e. showoff, careful). Mutual training sessions very helpful. Help them get to know your area and problems. Survial experience. Maintain list with FAA or military rating - hours etc.

D. Scanners - Qualified in ground SAR operations and aircraft use in SAR. May come from the ground crew or be a special SAR team. May work with aircraft for technical rescues or be observers in aircraft during searches. A paramedic should be on the team.

Scanners must be trained in the special techniques required for effective airborne observation - low time pilot.

1.3 GROUND CREW

A. Air Operations Officer - The man responsible for all air ops, needs assistance as necessary. Be a manager of people. Know capabilities of aircraft. Has the responsibility and the authority. Basically a technician. Has training and experience. Knowledge of various types of aircraft - capabilities and limitations, weather factors that will influence use, servicing needs (i.e., fuel, special equipment), safety factors.

1. In a small operation using 1 or 2 aircraft operating from a regular airport, the air officer may fly "cap" or fly a search area.
2. In larger operations using many aircraft this position demands good communications between on-scene, airport, and aircraft on flight operations.
3. In cases of helicopters especially, and sometimes fixed wing operations from non-staffed airfields, or heliports a technician must fill this job and be on the scene at all times. He will maintain:
   Safety of SAR personnel and public. Keep operation leader informed. Coordinate flights, patterns, supplies. Assists pilots as requested. ("Go-Fer") Supervises a crew to accomplish the above. Load and unload.

B. Crew - Work under air operations manager or heliport manager. Should have training and experience.

Knowledge of special techniques such as hand signalling, use of smoke or markers, 1 skid landings, paracargo drops, heli-jumping, safety rules, sling loads.

2. THE AIR SAR OPERATION

Directed by Air Ops Officer under Master Plan of On-Scene Coordinator

2.1 SAR OBJECTIVE

Pre-planning, organization, needs for next day's operations. Determine type and number of aircraft needed. Terrain, weather, distance to fuel, size of area to cover, transport of SAR teams, scanning efficiency (no. of eyes) are factors which influence choice.

2.2 SEARCH AREA

Never accept the area as searched unless a 60% probability or better of detection has been attained. May use ground troops and hold aircraft on ground or hold ground personnel and do quick air recon. (Track spacing between aircraft) Sweep width - idea to complete assignment within fuel capability - POD - 24 to 48 hours most important. Datum point or datum line or area for search.

- Target (Search Object)
- Area
- Pattern
- Track Spacing (Coverage)
- Intelligence (Revised Mission Planning)

2.3 OPERATIONS BASE - Airfield, Air Strip, Heliport, Helipad - not base camp.

Proximity to operation area - communications with operation area?

Useful and safe for aircraft?

Communications - phone and radio.

Rest and feeding facilities.

Can operations base and SAR teams and other crews be kept separated?

Ground crew available?

2.4 BRIEFING

Operations briefs leaders and aircraft commanders only - they will brief their teams and crews.

A. Briefing Checklist

1. Operation objective, rundown on operation history, victim description. Target (search object), area, pattern, track spacing (coverage).
2. Chain of command.
3. Map, grid system used. Copies of maps to all. Latitude and longitude bearing from good topo point.
4. Communications - call numbers, frequencies, availablity of radios for teams and aircraft. Signal devices - any available to search subject? What other units on scene?
5. Safety rules. Radio guard, 15 min., ops normal for single engine, 30 min. ops normal for double engine.
6. Terrain and weather conditions, forecast.
7. Checking in and out (SOP).
8. Press release (SOP).
9. Food and rest facilities, fuel, special gear available.

B. Assignments

Pilot knows his aircraft and its capabilities. Teams are assigned duties. With aircraft, it is usually necessary to discuss with pilots the best procedures, techniques and in searches, patterrs to be used. Search down the sun side. Use light to search advantage.

2.5 AIR SEARCH PROCEDURES

A. Fixed wing - generally most effective in relatively open terrain. Try not

to have fixed wing and helicopters in same area. If necessary to have both in same area, have fixed wing fly at higher altitude than copters. Use landing lights and beacons for better visibility and team work.

B. Helicopters - can operate at lower altitudes, slower speeds and in tighter areas than fixed wing. Can often get personnel close to summit registers to check if subject got there; check to save time and energy rather than long hike in.

C. Assign each aircraft to its own area, not together. This obviously frees pilots from looking out for other aircraft all the time and permits them to use scanners for searching.

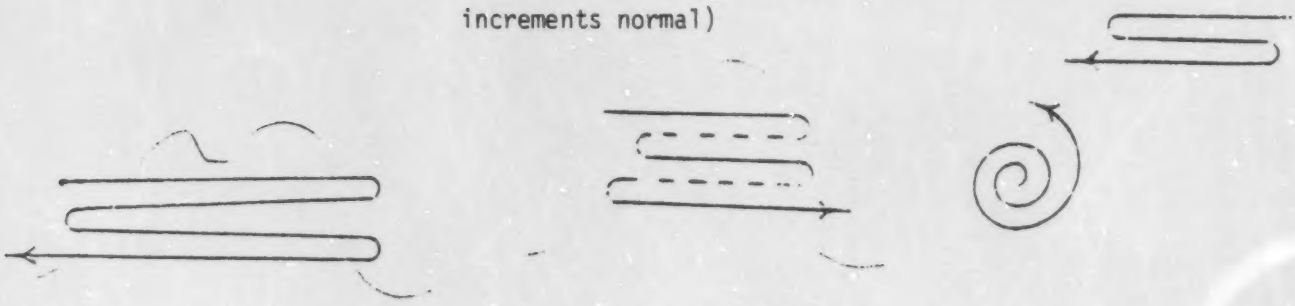
D. Any aircraft working in adjacent areas should have communications between them for safety. Ideally, air and ground teams should also have communications to each other. 122.0 for search - 123.1 for recovery and rescue. Reference and ID teams by ground position when requesting air recon in area. Use signal devices and marker panels for ground/air position reference. Regional Subdivision's

E. Try to do roughest terrain in early a. m. before rough air sets in. Consider night search - 20, 30 minutes search in highest area of probability - search for light, fire, signalling devices. Maintain safe altitudes, especially at night!

F. Search patterns - no hard and fast rules; decided on for each individual operation depending on circumstances. Generally each aircraft will take an assigned area, determined by grid lines or natural features, and search that area at the altitude and terrain which the pilot and air ops officer thinks most effective. Match the search area to aircraft and pilot capabilites. Some types of patterns - Before choosing search pattern, check the area and plan the whole thing out first.

Contour - follows elevation contours, start at top and work down.

Slope - ridge or large mountain - search by altitude up and back across the mountain by altitude (500' increments normal)

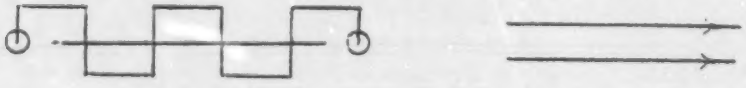


Small Mountain -

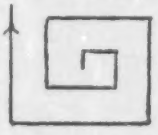
Route - follow probable travel route of subject

"Track Line" best quick search method if you have datum line A to B, departure point to arrival point.

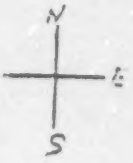
Parallel - search each side and overlap route

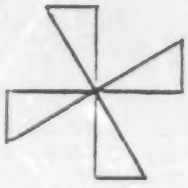


Expanding square - start at central point and work out



Vector - start at central point and follow bearings





Sector Search - Size and sectors determined by mission type, terrain, area of interest.

Add Area - Scott or Military Gride vs. "Real Grid"

G. Flight altitude - searching for individual generally 300' or less above ground to be thorough and less than 60 mph. Depends on ground cover. Remember, although subject may have last been seen wearing a red parka, he may have discarded it and now only have on dark clothes or a child may have taken refuge under brush or be hiding because he is afraid of punishment.

2.6 SCANNING PROCEDURE - Air search starts on ground. Brief mission, establish hand signals - discuss emergencies - never fly search pilot alone - use at least one trained observer.

A. Motivation/morale: Observing from aircraft can be tiring and boring so it is important to get highly motivated persons and to reinforce their motivation from time to time.

B. Insure all searchers will have a description of subject. Remind observers to concentrate on looking for a person or anything unusual. Do not concentrate on looking for a "red parka" only. Remember, a standing person can be practically invisible when viewed from above.

C. If possible, observers should have previous flight experience (it is easy to get airsick when concentrating for long periods at terrain rushing by, especially if the air is turbulent). Knowledge of the terrain is helpful. Observers should wear comfortable clothes and have reasonably comfortable seats.

A two pilot operation allows you to switch positions in the aircraft from time to time (change sides), there should be opportunities for snacks and coffee, windows should be clean or use open hatches and a reasonable but not overuse of intercom is helpful. All should have sunglasses. Binoculars are used only to thoroughly check out a possible sighting.

2.7 SCANNING METHOD - Establish desired search distance by focusing on a point approximately that distance from aircraft.

A. From nose or pilots position - eyes move no more than 3-4^{o} lateral/vertical distance at a rate to cover 10^{o} or less/second.

B. From side of aircraft - eyes move outward from craft to bounds of area or visibility and back toward craft. Or proofreading method - from top of area to bottom and left to right and back again, 1/2 mile to a mile from airplane.

C. Periodically focus on a specific object in or out of aircraft since there is a tendency to focus short after a while of observing.

D. Average range for - mirror - 5 miles 3 miles - flashlight at night
Aids to detection - smoke - 5 miles 1/2 mile - orange shirt

2.8 SIGHTING PLAN

A. To minimize losing a contact, it is important to follow a procedure to check out the sighting. The observer keeps his eyes on the object and continues to call the location while the aircraft attempts to get in position for a thorough check. Use degree bearings or perferably the clock system (aircraft nose is 12 o'clock) or prominent land features. Good ideas to refer to L 9:00 or R 3:00 - when in haste we often make mistakes.

B. Keep the contact inside the turn and keep circling. Reference the contact to a prominent land feature. If you lose sight of the object, do a procedure turn, return to the reference point and re-establish visual contact.

C. If in contact with radar following get them to lock on (V VIRON Omni fix)

D. Communication - tell people at base what you saw - lat. - long. - position or grid - condition of victim. Any drops needed? Equipment needed to drop?

Air evacuation possible? Access route for ground team? Check surrounding terrain for ingress and identify prominent references.

Drop smoke or marker (toilet paper) if possible over location. If ground teams nearby, aircraft should maintain position and direct them to location.

E. Intelligence - Get Polaroid photos of objective, relationship to terrain features to On-Scene Coordinator and recovery teams. Use secondary aircraft if available. Mark photos with magnetic heading, circle area of interest.

2.9 RECOVERY

Keep a competent, equipped team at base or in other readily available location in event they are needed. Precious time can be lost rounding up the proper team if none have been kept on standby. Medic, helio flight - keep air on scene to vector ground in.

2.10 DEBRIEFING - Maintain a checklist and routine and obtain specific information to aid in the pre-planning of the next operation. Tape comments during mission and critique.

A. Close out all flight plans/logs. Are all accounted for?

B. Daily debriefing if mission continues.

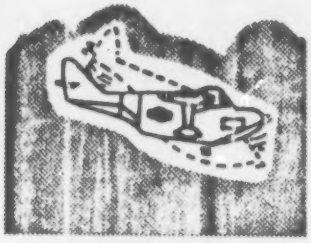
C. A word of thanks to aircraft personnel; give them credit in the press; letters of appreciation. If the flying's over, invite them for a beer and that's a good time to jawjack about how the operation went.

Adapted from original outline of
John Dalle-Molle
Mt. Rainier 4/74

STANDARD AIRCRAFT ACKNOWLEDGEMENT

MESSAGE RECEIVED AND UNDERSTOOD

MESSAGE RECEIVED AND NOT UNDERSTOOD



AFFIRMATIVE

NEGATIVE

FIGURE C-5

MISCELLANEOUS EMERGENCY SIGNALS

The following signals are sufficiently used so that SAR personnel should have some knowledge of them:

1. Visual

(a) Inverted U.S. flag. Used as a distress signal by marine craft in the United States.

(b) The following are used as a surface-to-air distress recognition signal. When spread horizontally or waved they indicate that this is the unit in need of assistance.

(1) A cloth of international orange color (United States).

(2) A cloth of international orange color with a black square and ball inscribed thereon (United States and Canada).

(3) A cloth of red color (Caribbean territories).

(c) Green fluorescent dye marker.

(d) Flashes as from a signal mirror.

(e) Smoke from signal fires. Note: Three signal fires arranged in a triangular pattern is a positive signal of distress.

2. Radar

(a) IFF/SIF (or civilian counterpart) code 7600—Lost radio communications.

(b) IFF/SIF (or civilian counterpart) code 7700—Distress.

(c) Right hand triangular pattern—Have operating receiver only.

(d) Left hand triangular pattern—Have no receiver.

(e) Radar chaff—Distress.

3. Emergency Position Indicating Radiobeacon Signals

(a) VHF/UHF (121.5 and 243 MHz). A distinctive audio characteristic achieved by modulating the carrier by an audio frequency sweeping downwards over a range of not less than 700 Hz within the range of 1600 to 300 Hz, with a repetition rate of between two and three sweeps per second. Note: Older beacons may have a steady tone, a warbling tone or a "beep beep" tone.

(b) HF (2182 kHz). An audio characteristic as follows:

(1) *Low power beacons.*—A single tone having a ratio of sound to the period of silence equal to or greater than one and the sound duration between one and five seconds.

(2) *High power beacons.*—As in (1) but with the cycle consisting of the single tone sound signal for between thirty and fifty seconds followed by a period of silence of between thirty and sixty seconds.

(3) *Low or high power beacons.*—The radiotelephone alarm signal followed by the Morse letter "B" and/or the call sign of the ship to which the radio beacon belongs.

BEST COPY AVAILABLE

A MANAGEMENT COURSE FOR ANYONE RESPONSIBLE FOR OR DEDICATED TO THE TASK OF SEARCHING FOR OR RESCUING OF PEOPLE IN DISTRESS

MANAGING THE SEARCH FUNCTION

(FINDING A LOST PERSON QUICKER)

A MANAGEMENT COURSE FOR ANYONE RESPONSIBLE FOR OR DEDICATED TO THE TASK OF SEARCHING FOR OR RESCUING OF PEOPLE IN DISTRESS

MANAGING THE SEARCH FUNCTION
COURSE OBJECTIVES

1. *MANAGE A SEARCH*
2. *DISCUSS ELEMENTS OF A SEARCH PREPLAN; DESCRIBE ITS IMPORTANCE TO SUCCESSFUL MISSION*
3. *IDENTIFY BASIC SAR RESOURCES; DISCUSS THEIR FUNCTIONS AND LIMITATIONS*
4. *DESCRIBE TACTICS USED IN SEARCH FOR LOST PERSONS*
5. *DESCRIBE RESOURCES/SEQUENCE OF INITIAL ACTION IN APPLYING SAR RESOURCES TO FIND MISSING SUBJECT*
6. *DESCRIBE FUNCTIONS OF EFFECTIVE ORGANIZATION*
7. *DEMONSTRATE ABILITY TO ESTABLISH SEARCH AREA IN A GIVEN MAP PROBLEM*
8. *IDENTIFY KEY FACTORS INVOLVED IN DECIDING TO SUSPEND A MISSION*
9. *DISCUSS IMPORTANCE OF PREVENTIVE SAR PROGRAMS*
10. *DESCRIBE FUNCTION OF CLUE DETECTION IN RELATION TO SEARCH THEORY*

A NATIONAL SAR TRAINING COURSE
CONDUCTED AND SPONSORED BY THE
NATIONAL ASSOCIATION FOR
SEARCH AND RESCUE, INC.

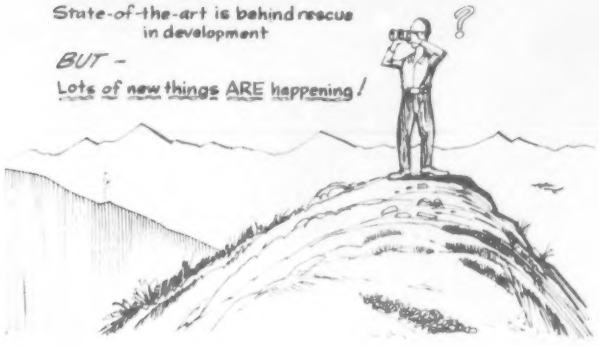
NATIONAL ASSOCIATION FOR SEARCH AND RESCUE

LAND SEARCHES

State-of-the-art is behind rescue in development

BUT -

Lots of new things ARE happening!



Awareness Education

FOR INFORMATION AND APPLICATIONS FORMS, CALL (714) 268-3611 OR SEND TO
THE NATIONAL ASSOCIATION FOR SEARCH & RESCUE, MEMBERSHIP SERVICES
P.O.BOX 2123, LAJOLLA, CALIFORNIA 92038

NAME PHONE AGE

ADDRESS

(ZIP CODE)

INFORMATION ABOUT WILDERNESS ADVENTURES

● *SKIING* ● *HIKING* ● *TRAINING SEMINARS* ●

BEST COPY AVAILABLE

AIRCRAFT and HELIRESCUE MANUAL

Another Instructional Aid For

RESPONSE
RESCUE
RECOVERY
TRAINING

from

SURVIVAL EDUCATION ASSOCIATION
9035 Golden Givens Road
Tacoma, Washington 98445

BEST COPY AVAILABLE